# Design and evaluation of a school-based intervention programme to improve children's eating habits as a contribution to preventing childhood obesity

Scott, Gwenda

*Awarding institution:*
King's College London

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**Author:** Gwenda Scott

# DESIGN AND EVALUATION OF A SCHOOL-BASED INTERVENTION PROGRAMME TO IMPROVE CHILDREN'S EATING HABITS AS A CONTRIBUTION TO PREVENTING CHILDHOOD OBESITY

**GWENDA SCOTT**

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**ABSTRACT**

Background: Childhood obesity in the UK is increasing. Possible explanations are changes in dietary patterns and eating habits together with an increase in sedentary lifestyles. There is evidence that multifaceted school-based interventions have some success in reducing childhood obesity. This study aimed to develop and test the feasibility of a school-based intervention programme aimed to improve children's lifestyle behaviours and eating habits as a contribution to preventing childhood obesity.

Methods: Nine primary schools from highly deprived wards in Bexley took part in a baseline study to collect information on obesity, eating and activity patterns and body shape satisfaction of children aged 9-11. The data were used to produce materials to be used in the schools. The intervention programme involved curriculum-based and extra-curricular activities and was used with 350 children in 4 schools over a 6 month period, with 5 others as controls.

A repeat of the baseline study at the end of the intervention period in all schools investigated the effect of the intervention on the eating patterns of children. A further study was undertaken after 1 year to look at the longer term effect of the intervention.

Results: Nearly a third of those measured were either overweight or obese. Children exhibited signs of body shape dissatisfaction. About a third of boys and over 40% of girls indicated they wanted to be thinner than their perceived shape. Following the intervention, changes in eating habits found in the intervention schools were increased vegetable intake at the evening meal and reduced consumption of snacks during the day. Positive changes in eating patterns were also seen in all schools between surveys. The intervention did not appear to have any impact on the body shape dissatisfaction of children.

Conclusion: The intervention had some impact on improving vegetable intakes and consumption of healthier snacks in children.

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| | |
|---|---|
| ALSPAC | Avon Longitudinal Study of Parents and Children |
| APPLES | Active programme promoting lifestyle education in schools |
| BMI | Body Mass Index |
| CATCH | Child and Adolescent Trial for Cardiovascular Health |
| CCOPENI'S | Community-based Childhood Obesity Prevention Environmental Nutrition Interventions |
| CMO | Chief Medical Officer |
| COMA | Committee on Medical Aspects of food and Nutrition Policy |
| CRD | Centre for Reviews and Dissemination |
| DCSF | Department for Children, Schools and Families |
| DEFRA | Department for Environment, Food and Rural Affairs |
| DH | Department of Health |
| DRV | Dietary Reference Values |
| EPODE | Ensemble, prevenons l'obesite des enfants |
| FIQ | Food Intake Questionnaire |
| HSCIC | The Health and Social Care Information Centre |
| HSE | Health Survey for England |
| IMD | Index of multiple deprivation |
| IOTF | International Obesity Task Force |
| KOPS | Kiel obesity prevention study |
| LIDNS | Low Income Diet and Nutrition Survey |
| NAFLD | Non Alcoholic Fatty Liver Disease |
| NCMP | National Child Measurement Programme |
| NDNS | National Diet and Nutrition Survey |
| NHS | National Health Service |
| NICE | National Institute for Health and Clinical Excellence |
| NHSP | National Healthy School Programme |
| NICE | National Institute for Health and Clinical Excellence |
| NME | Non Milk extrinsic sugars |
| NOO | National Obesity Observatory |
| NTS | National Travel Survey |
| RCT | Random Controlled Trial |
| SAPAC | Self administered physical activity checklist |
| SCT | Social Cognitive Theory |
| SHEU | Schools Health Education Unit |
| SIGN | Scottish Intercollegiate Guidelines Network |
| UK | United Kingdom |
| USA | United States of America |
| WHO | World Health Organization |
| YAQ | Youth administered questionnaire |

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# CHAPTER 1

# INTRODUCTION

## 1.0 Overview

The prevalence of overweight and obesity in most countries worldwide is increasing and the World Health Organisation (WHO) estimate that globally in 2010 there were 43 million children under the age of 5 years who were overweight (WHO 2011). The cost of obesity can be measured in personal costs such as morbidity and mortality, social costs such as discrimination and also the economic cost on the healthcare system and the wider economy due to chronic ill health. In the UK, Foresight forecast that the cost to the wider economy could increase to £50 billion per year by 2050 if the prevalence of overweight and obesity continues to rise (Butland *et al*., 2007).

The causes of obesity are complex and multi-factorial and often have their origins in childhood. Potential risk factors for obesity in childhood and its association with obesity in later life have been identified (Reilly *et al.,* 2005). In addition to biological factors which cannot be altered, other risk factors like eating and activity patterns are modifiable at the individual level, although social, economic and other factors may play an important part in shaping these aspects of behaviour. The consequences of overweight and obesity in children include both short and long term adverse effects. They are more likely to experience both physical and psychological problems and are vulnerable to increased body shape dissatisfaction (Scottish Intercollegiate Guidelines Network (SIGN), 2010). School-based interventions have been identified as one of the potential strategies to reduce childhood obesity (Swinburn *et al.,* 2004), offering opportunities to mobilise cognitive and social factors influencing behaviour and access to food.

This current study aimed to investigate the eating and activity patterns of children and the influence of factors such as knowledge, parental control, food preferences, body size and

satisfaction with body shape in influencing this behaviour. This information was used to design a school-based intervention to improve children's lifestyle behaviours with a focus on increasing intake of fruit and vegetables and decreasing intake of high fat and high sugar foods. The intervention was evaluated by determining its impact on the eating patterns of children with a key focus on fruit and vegetable intake, breakfast and snacks. Anthropometric data was also collected and satisfaction with body shape was also monitored in all surveys. The degree of body satisfaction was not only considered when interpreting the impact of the intervention but also in relation to possible negative effects of the intervention.

### 1.1 Prevalence and trends in obesity

The prevalence of overweight and obesity in most countries worldwide is increasing and is occurring in all age groups: the World Health Organisation estimated in 2005 that there were 1.6 billion overweight and 400 million obese people in the world (WHO 2006). Globally in 2010 the WHO estimated that the number of overweight children under 5 years to be over 43 million (WHO 2011). In the UK the rates have doubled over the last 25 years, it was estimated that one third of adults and one fifth of children would be obese by 2010 (Zaninotto *et al*., 2006). Wang *et al.* (2011) projected a trend of 11 million more obese adults in the UK by 2030. It has also been predicted that in the UK nearly 60% of the adult population and 25% of children and young people under 20 year old could be obese by 2050 (Butland *et al.*, 2007).

The Health Survey for England (HSE) collects data to measure health and health-related behaviours in adults and children for England and Wales on an annual basis and these are used to determine current trends of obesity in England, these data are used as a reference point for the current study.

Body Mass Index (BMI) is routinely used to define overweight and obesity at a population level for adults. It is defined as a person's weight (kg) divided by the square of their height ($m^2$) and the classification of overweight and obesity in adults by BMI is:

| | **BMI($kg/m^2$)** |
|---|---|
| Underweight | less than 18.5 |
| Healthy weight | 18.5-24.9 |
| Overweight | 25-29.9 |
| Obese | 30-39.9 |
| Morbidly obese | 40 or more |

Source: WHO, 2000

In 2009 22% of men and 24% of women in England were obese and almost two thirds of all adults were either overweight or obese, with the mean body mass index (BMI) of 27$kg/m^2$, outside the healthy weight range for adults (Health and Social Care Information Centre (HSCIC) 2010).

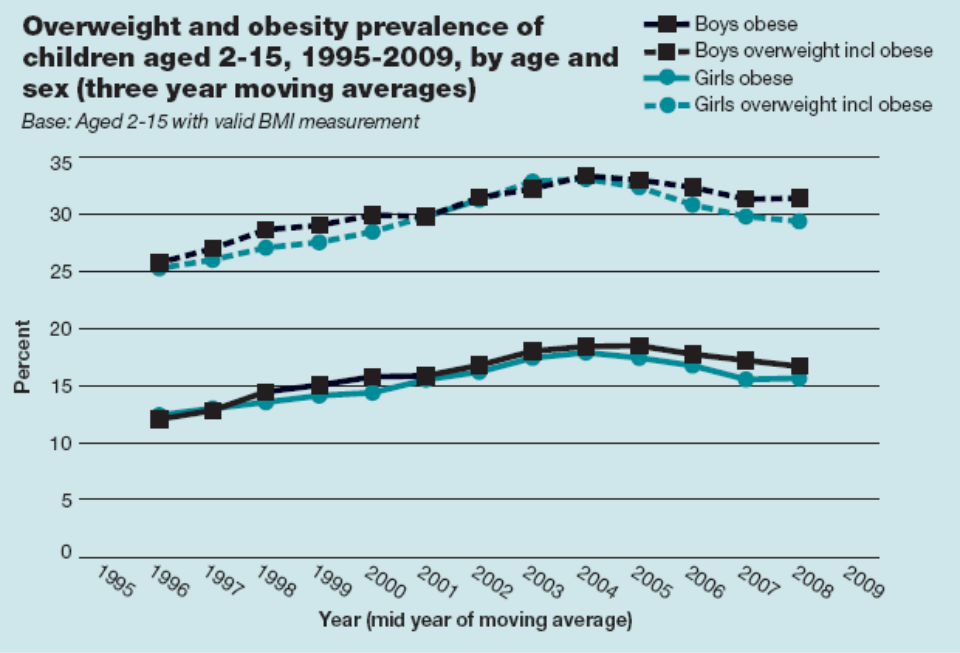
Measuring overweight and obesity in children is more complex, the BMI value is subject to variation by age and gender, thus interpretation of BMI needs to be compared to population reference data, and this means that there is no universally accepted BMI classification system for children aged between 2 and 18 years. In the UK, the National Institute for Clinical Excellence (NICE, 2006) and the Scottish Intercollegiate Guidelines Network (SIGN, 2010) have recommended that BMI values should relate to the UK 1990

BMI growth reference charts (Cole *et al.*, 1995) and that for epidemiological work a definition of obesity more than the 95$^{th}$ centile and overweight over the 85$^{th}$ centile of the UK 1990 reference chart for age and sex is used. This is the criteria used in all HSE reports and more recently with the introduction of the National Child Measurement Programme (NCMP) whereby all children in Reception year (4-5 years) and year 6 (10-11 years) in primary schools are measured to determine the prevalence of childhood obesity (DH, 2006).

An alternative method for defining childhood obesity proposed by the International Obesity Task Force (IOTF) in 2000 was based on data from 6 countries around the world (Cole *et al.*, 2000). This produced age- and sex-specific BMI cut off points for children aged 2-18 corresponding to a BMI of 25 or 30 in adults. These were based on the evidence of association between adult cut-off points for overweight and obesity and health risks. The benefit of the IOTF classification is that it allows international comparison of obesity and a smooth transition in measurement from children to adults. The disadvantage is that it has been reported to exaggerate the differences in overweight and obesity between boys and girls by underestimating prevalence in boys. The IOTF classification was used in the UK Government Foresight programme (Butland *et al.*, 2007) to predict the future trend of childhood obesity.

The prevalence of childhood obesity in England has increased between 1995 and 2009 as reported by the HSE (HSCIC, 2010). For children aged 2-15 the proportion who were obese increased from 11.5% in 1995 to 16.0% in 2009 (10.9% to 16.0% for boys and 12.0% to 15.0% for girls) (Figure 1).

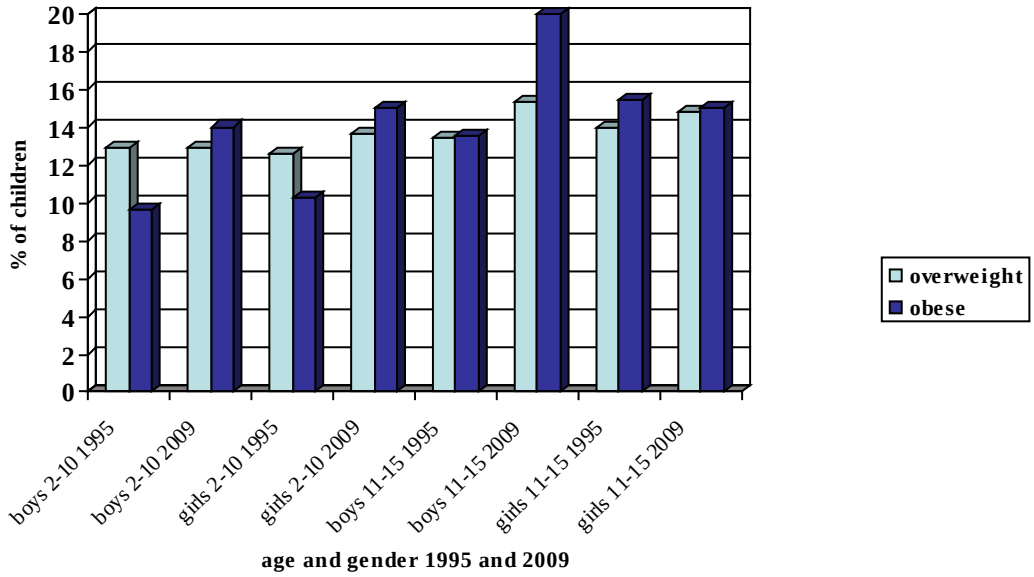
**Fig 1 Overweight and obesity prevalence among children aged 2-15 years in England, 1995-2009**




Source: Health and Social Care Information Centre, 2010 (Health Survey for England 2009)

The prevalence of overweight in children remained at similar levels during 1995-2009 (around 13 to 15%). The increase in the proportion of children who were obese occurred in both boys and girls in younger children aged 2-10. In the older children aged 11-15 obesity increased significantly in boys but not in girls. These changes are shown in Figure 2.

**Fig 2 Comparison of prevalence of overweight and obesity among children in England according to age and gender in 1995 and 2009**




Source: Health and Social Care Information Centre, 2009 (Health Survey for England 2007)

In 2009, three in ten boys and girls in England aged 2-15 years were either overweight or obese, a total of nearly 3 million children, with half of these children obese. No significant difference in overweight or obesity prevalence was observed between boys and girls whereas in previous years boys were more likely to be classified as overweight or obese. Earlier studies that supported the increasing prevalence of overweight and obesity amongst children of all ages in the UK include, Reilly and Dorosty (1999), Reilly *et al.* (1999), Rudolf *et al.* (2001) which estimated that the prevalence of obesity ranged from 9% in preschool children to 17% in 15 year olds. All of these studies used the national BMI percentiles classification.

Between 2005 and 2009 there has been no statistically significant change in the prevalence of obesity among children suggesting that the trend may be flattening out. Analyses based on the HSE data between 2000 and 2007 by McPherson *et al.*, 2009 forecast that the trend

in obesity prevalence in children may be levelling out and the latest forecast for 2020 predicts much lower proportions of overweight and obesity in boys and girls aged 2-11 years (from 22% to 17% for boys and 34% to 17% for girls). A study of the prevalence of obesity in 9-10 year-old children in Liverpool between 1998 and 2006 also reported a 'levelling off' in prevalence of obesity since 2003 (Boddy *et al.*, 2009).

Variation in obesity prevalence by socio-economic group, parental BMI and ethnicity has been reported in the HSE reports. In 2007 girls aged 2-15 years in the lowest income group were more likely to be obese (22%) compared to girls from the highest income group (9%) but no significant differences according to income group were found in boys (HSCIC, 2008a). Children living in households where both natural parents or a lone natural parent were overweight or obese had a higher prevalence of obesity than children living in households where parents were normal weight or underweight. This was found for both boys and girls where 24% of boys and 21% of girls were obese in overweight/obese households compared to 11% and 10% in normal/underweight households (HSCIC, 2009). The prevalence of obesity is significantly greater in Black African, Black Caribbean and Pakistani boys and Black African and Black Caribbean girls, but these are based on only small samples of children (HSCIC, 2009).

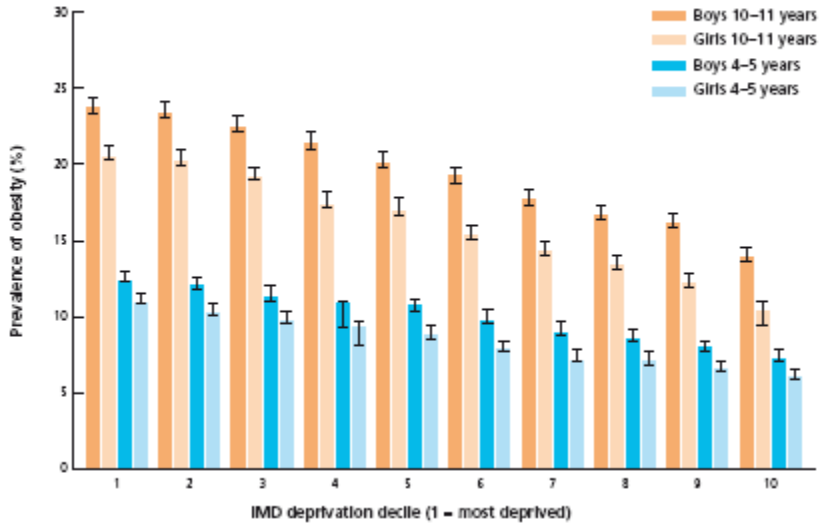
The 2009/10 National Child Measurement Programme (HSCIC, 2010) measured over 1 million children (526,499 children in reception and 499,867 children in year 6) and reported that nearly 10% of children in reception year and over 18% of children in Year 6 were obese, with boys more likely to be obese than girls, (Table 1).

**Table 1 Prevalence of overweight and obesity in children by school year from NCMP 2009/10 data**

| | Reception | Year 6 |
|---|---|---|
| Underweight | 0.9% | 1.3% |
| Healthy weight | 76.0% | 65.4% |
| Overweight | 13.3% | 14.6% |
| Obese | 9.8 % | 18.7% |

Recent analysis of the NCMP results (National Obesity Observatory, 2009) has reiterated the links between deprivation and increased risk of obesity reported by the HSE. They found that children from the most deprived areas had the highest risk of obesity with a linear decrease as the levels of deprivation decreased (Figure 3). Increased prevalence of obesity was also seen in children from black ethnic minority groups which support findings from the HSE sample.

**Fig 3 Prevalence of obesity by age, gender and deprivation from NCMP 2007/08 data**




Source: NCMP 2007/08, IMD 2007

The Low Income Diet and Nutrition Survey (LIDNS) (Nelson *et al.,* 2007) found that 21% of children in the study aged 2-18 years were obese and a further 14% were overweight (based on the UK 1990 BMI growth reference charts), but due to the small sample base could not report any significant differences from the results of the HSE.

### 1.2 Consequences of childhood obesity

Obesity has serious long and short term consequences on health. Jebb (2004) noted the association with premature death and a potential to reduce life expectancy by 3-13 years, the excess mortality being greater with increasing severity of obesity and the earlier onset. In a review of the effect of childhood obesity on lifespan Olshanky *et al*. (2005), reported a shorter lifespan according to the level of obesity and its co-morbidities. However others have suggested that this will be balanced by the future availability of improved healthcare (Daniels, 2006).

Childhood obesity has significant adverse effects on health during childhood, many with consequences for adult health (Reilly *et al.* 2003, Speiser *et al*. 2005, Daniels, 2006): it is associated with the presence and clustering of cardiovascular risk factors in childhood (increased blood pressure, adverse lipid profiles, adverse changes in left ventricular mass and hyperinsulinaemia) which persist into adulthood and these predict a strong link between childhood obesity and morbidity in adulthood. Many of the cardiovascular risk factors have been have been identified in studies of obese children aged 5-10 years (Freedman *et al.,* 1999). In the Bogalusa Heart Study an association was found between overweight during adolescence and an increased cardiovascular risk in adults which included an 8.5 fold increase in hypertension and 3 fold increase in high LDL serum

cholesterol levels (Srinvivasan *et al.*, 1996). More recently they have also reported that in overweight children those with high waist/height ratio are more likely to be associated with adverse risk-factor levels (Freedman *et al*., 2009). However, the link between childhood obesity and adult cardiovascular disease risk was challenged in a review by Lloyd *et al.* (2009) which stated that there was little evidence that childhood obesity was an independent risk factor for cardiovascular disease risk as the relationship observed was dependant on the tracking of BMI from childhood to adulthood and previous studies had not adjusted for this.

The metabolic consequences of overweight/obesity in childhood include the increased risk of type 2 diabetes in adolescence, previously only thought to occur in adults, which was first reported in the UK by Drake *et al.,* in 2002. Kopelman, (2007) reported concern about the increasing prevalence of type 2 diabetes and its associated medical complications in childhood in his review of obesity- related health risks. It has been reported that in some paediatric populations 40 to 50% of newly diagnosed diabetes has been of type 2 (Goran *et al.,* 2003). Obesity is thought to be the most important risk factor associated with type 2 diabetes and childhood obesity is a strong predictor of metabolic syndrome in early adulthood.

Increased prevalence of non-alcoholic fatty liver disease (NAFLD) has been seen in obese children, with 10-20% of obese children diagnosed with the condition. Inflammation and fibrosis can progress to necrosis and cirrhosis and it now the most common form of chronic liver disease in children (Krebs *et al.,* 2007). Other health consequences of obesity presenting in childhood include orthopaedic problems e.g. slipped femoral epiphysis,

ankle sprains and flat feet. Respiratory problems include sleep apnoea and exacerbation of existing asthma (Speiser *et al.,* 2005).

Overweight and obese children are also more likely to experience psychological or psychiatric problems than non-obese children (NHS Centre for Reviews and Dissemination (NHS CRD), 2002). It has been suggested that interactions and common pathways between childhood obesity and depression exist and treatment should target these underlying shared mechanisms (Reeves *et al.,* 2008), although it has been postulated that obesity limited to childhood has little impact on the psychological outcomes in adult life (Viner and Cole, 2005). Overweight and obese children are subject to bullying but a study by Janssenn *et al.* (2004) of children aged 11-16 years found that these children were also the perpetrators of bullying behaviour. Many children at risk of obesity have a lowered self-esteem which occurs in early adolescence and which was associated with sadness and loneliness; they were also more likely to have unhealthy or risky behaviours such as smoking and drinking alcohol (Strauss, 2000). SIGN, 2010 stated that obesity in childhood is associated with poor self esteem, disordered eating and body dissatisfaction. Studies have shown that body image dissatisfaction occurs in pre-adolescent children and obese children aged 9 have been shown to have reduced physical appearance self-esteem, being more pronounced in girls (Hill *et al.,* 1994) and body image dissatisfaction has also been reported in overweight and obese Italian children aged 8-9 years (Gualdi-Russo *et al.,* 2008). There is also a link between obesity and educational attainment and future employment prospects in women, which could be accounted by the discrimination against overweight persons (Gortmaker *et al.,* 1993).

## 1.3 Causes of childhood obesity

The possible explanations given for the recent increase in obesity levels are changes in dietary patterns and eating habits together with an increase in sedentary lifestyles interacting with the individual's susceptibility to weight gain (NHS CRD, 2002), Parliamentary Office of Science and Technology (2003). The causes of obesity are complex and multi-factorial, the individual's biology and behaviour is influenced by secondary factors that include environmental, social, cultural and psychological determinants. Some of the potential risk factors for obesity are modifiable by decisions and choices made at an individual level, others determined by family and society and the wider environment. An 'obesity systems map' was developed as part of the Foresight report in 2007 (Butland *et al*., 2007) to represent the interrelationships between the 108 variables that determine the energy balance of the individual or group in the UK. The variables are clustered into 7 themes, shown thematically in Figure 4 to illustrate the complexity of the relationships. Each cluster consists of many variables, each highly connected with negative or positive influence on energy balance and consideration needs to be given to the impact on other clusters when intervening on any theme.

### 1.3.1 Theme 1 –Biology

Over the last decade genetic and molecular epidemiology studies have improved the understanding of the genetic factors contributing to the development of obesity and the individual's susceptibility to maintaining energy balance. A number of specific genes associated with obesity have been identified in human studies. Single gene defects account for rare, severe, childhood onset obesity. For the majority obesity is thought to be an

oligenic disease with susceptibility genes and modifier genes interacting with each other and with environmental factors (Fruhbeck, 2005; Bouchard, 2009).

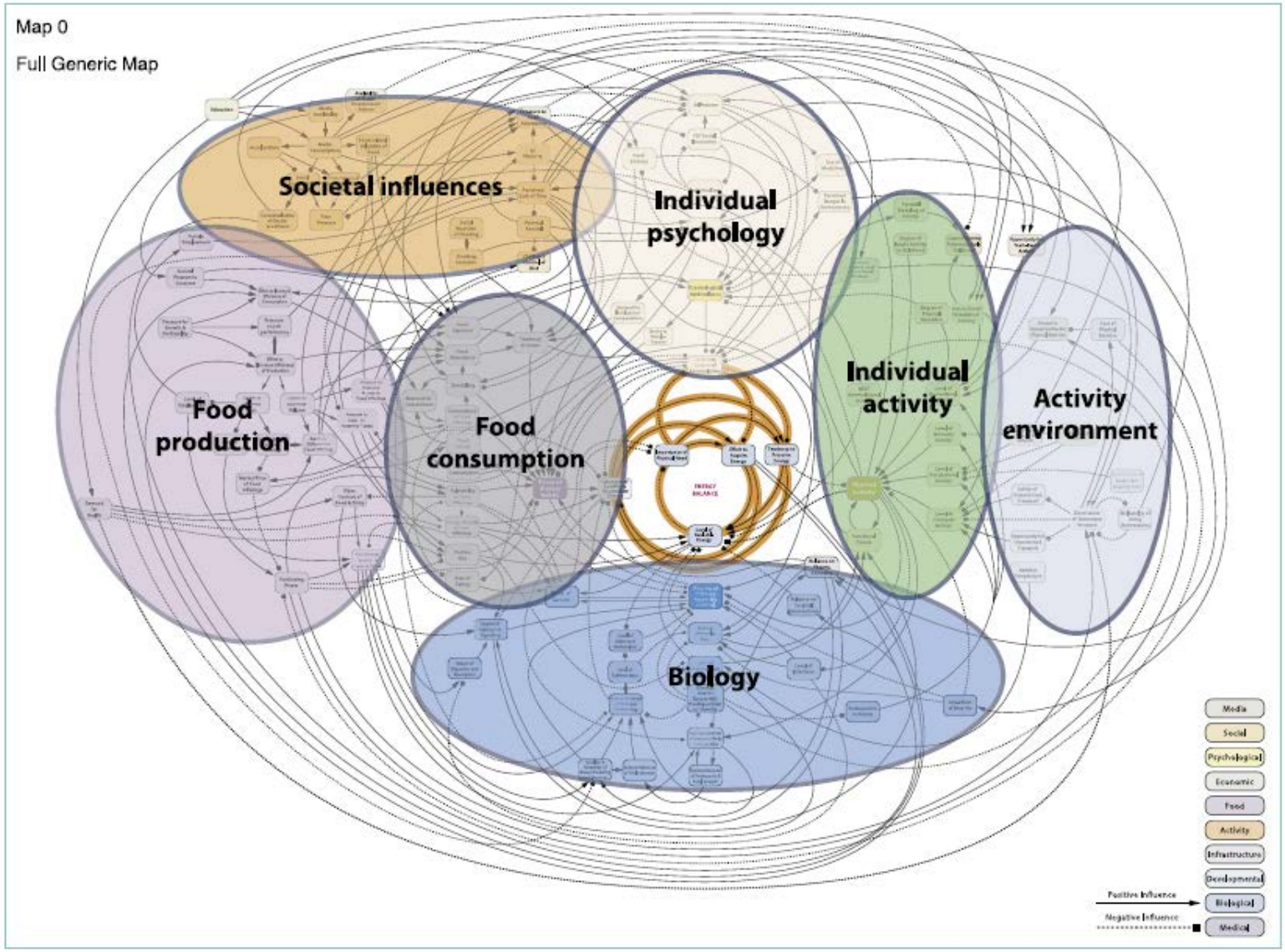
Studies have identified hormonal and neural pathways that regulate energy balance (Farooqi and O'Rahilly, 2007). It is now thought that body weight control involves; the emotional cues to eating, hormones released during digestion and absorption, hypothalamic control mechanisms and the role of adipose tissue in regulating appetite. The hypothalamic control mechanisms regulate feeding behaviour through the interactions of peptides, hormones and neurotransmitters through orexigenic and anorexigenic signals. Adipose tissue regulates appetite through the release of the hormone leptin which is involved in the long term control of energy intake. When fat stores are low the levels of leptin fall which stimulates hunger, as body fat levels increase leptin is secreted which acts centrally to increase satiety.

It has been postulated that the efficacy of the orexigenic pathways at defending against starvation is more important than the anorexigenic pathways. It is thought that some individuals are susceptible to obesity because their appetite control mechanisms are not well balanced with food intake set above their energy needs which can only be overridden by conscious control. Recent research has shown that sensory factors such as palatability and availability of food can increase appetite so that it overcomes the innate control mechanisms described as hedonic hunger (Rolls, 2007).

The risk of obesity in later life is influenced by the pattern of growth in early years, breastfed babies have slower growth rates than formula fed babies and it is thought that this may be one reason why breast fed babies have lower rates of obesity as adults (Horta

*et al.*, 2007). In England the Infant Feeding Survey of 2005 (HSCIC 2007a) showed that only 50% of all new mothers were breastfeeding by week 6 and only 26% by 6 months. Differences were seen in the duration of exclusive breastfeeding by socioeconomic group, with mothers in managerial and professional occupations likely to breastfeed exclusively for longer than mothers in other socioeconomic groups.

**Fig4 Obesity system map representing the multi-factorial factors influencing the development of obesity**




Source: Foresight tackling obesities: future choices-project report 2007

Potential early life risk factors for obesity in childhood identified by Reilly *et al.* (2005) included increasing birth weight, parental obesity, weight gain in infancy, short sleep duration and television viewing of more than 8 hours per week at the age of 3. Possible explanations provided for these risk factors included; parental obesity may be a risk factor through genetics or shared family environments, short sleep duration of children aged 30 months may be linked to growth hormone secretion or increased food intake due to exposure to food in the evening. Also maternal smoking during pregnancy may increase the risk of obesity later in life, this was thought to be due to programming the regulation of appetite. It is also thought that weaning practices are important due to weight gain seen at about 5 years and its association with obesity later in life. In the UK new child growth measurement charts for 0-4 years based on growth of breast fed babies are to be used from 2009 (Scientific Advisory Committee on Nutrition, 2007).

### 1.3.2 Theme 2- Food consumption

Information on the dietary intake of children aged 1.5 to 18 years in the UK is derived from the National Diet and Nutrition Survey of 2008/2009-2009/10 (NDNS), HSE reports and the Food Standards Agency survey on Low Income Diet and Nutrition Survey 2007 (LIDNS). Results of the dietary assessments of children aged 7 years collected in 1999/2000 from the Avon Longitudinal Study of Parents and Children (ALSPAC) are available for information on the eating habits of young children (Glynn *et al.* 2005).
The NDNS survey showed average energy intake was lower than the requirements estimated by the Committee on Medical Aspects of Food and Nutrition Policy (COMA, 1994), but as the proportion of children who are overweight or obese continues to increase

it has been suggested that energy requirements have declined as children adopt a more sedentary lifestyle. The increase in obesity and fall in energy intakes over 20 years in the UK was reported by Prentice and Jebb in 1995, with the implication that at population levels, energy needs have declined faster then intake. This was also found in the LIDNS (Nelson *et al.*, 2007) where energy intake was below estimated energy requirement except for girls aged 2-10 years.

When looking at the composition of the diet, the NDNS survey showed that fat intake as percentage of total energy intake was in line with COMA recommendations, but intake of saturated fat was significantly higher than the recommendations. The intake of non-milk extrinsic (NME) sugars exceeded the Dietary Reference Values (DH, 1991) with soft drinks being the main source in children aged four to 18 years, contributing 29% of NME intake for children aged 11-18 years and 16% for children aged four to 10 years. A decrease in the average consumption of chocolate and sugar was seen in children of all ages compared to the previous survey in 2000. The Family Food in 2007 (DEFRA, 2008), the LIDNS (Nelson *et al.*, 2007) and ALSPAC (Glynn *et al*., 2005) reported similar findings with percentage of food energy from saturated fat and NME sugars above the recommendation.

The NDNS (2000) found that the consumption of fruit and vegetables had fallen over the last 20 years and more than half the children surveyed ate no fruit or vegetables in a week. However in recent years the intake of fruit and vegetables has slowly increased and the HSE 2009 (HSCIC, 2010) reported one in five children were eating 5 or more portions of fruit and vegetables a day (21% boys, 23% girls), an increase from 11% in 2001, with younger children more likely to eat fresh fruit. The percentage of children who did not eat

any fruit and vegetables in 2009 had also decreased from 2001, (12% to 5% in boys and 10% to 4% of girls). The NDNS (2010) survey also found that the total consumption of fruit and vegetables in children was higher than the previous survey in children aged four to ten years and boys aged 11-18 years.

Fruit and vegetable intake was linked with equivalised household income, children in the top two quintiles were more likely to eat 5 or more portions of fruit and vegetables a day compared to the lower quintiles (HSCIC, 2009). The LIDNS (Nelson *et al.*, 2007) data also suggested that the low income population ate fewer portions of fruit and vegetables than the general population with on-average boys consuming 1.6 and girls 2 portions of fruit and vegetables each day. They found that many children (32% boys, 18% girls) ate no fruit during the recall days of the survey.

### 1.3.3 Theme 3-Individual activity

Information on the physical activity patterns of children in the UK is available from several sources including the NDNS, HSE reports, LIDNS, National Travel survey (NTS) and School Sport Survey. They all concur that the majority of children aged 2-15 years do not meet the Chief Medical Officer (CMO) of England recommendation of participating in physical activity of moderate intensity for at least one hour per day (DH, 2011a).

In the NDNS (2000) 40% of boys and 60% of girls were failing to meet the recommendation. More recently the HSE (HSCIC, 2007) calculated that 72% of boys and 63% of girls aged 2-15 years met this recommendation for out-of-school activities, with the proportion reporting high levels of physical activity declining in girls from about the age of 8 but remaining consistent for boys. These levels were similar to physical activity

levels found in the 2002 (DH, 2003b) and 2006 (HSCIC, 2007) surveys. In 2007 nearly a fifth of girls and 15% of boys reported low levels of physical activity or were not active at all. Regional variations were seen with children in London having the lowest levels of physical activity with only 63% of boys and 50% of girls meeting the recommended target (HSCIC, 2009). A relationship between sedentary time and BMI category has been reported for boys and girls, with a higher proportion of obese children report spending four or more hours on weekdays as sedentary compared to children not overweight or obese (HSCIC, 2010).

The LIDNS (Nelson *et al.,* 2007) found the majority of children from low income households were less likely than the general population surveys to meet the physical activity target. In this survey in contrast to the HSE (HSCIC, 2009) they found girls were more likely than boys to undertake 60 minutes of moderate physical activity each day in both the 2-10 years (31% of girls and 26% of boys) and 11-15 year (38% of girls and 34% boys) age groups. They also reported that that about half of boys and girls in the survey aged 2-10 years were active for less than 30 minutes each day. This improved for the 11-15 years olds with the proportion of boys active for less than 30 minutes decreasing to 28% but remained high at 41% for girls.

The School Sports Survey (Department for Children, Schools and Families (DCSF) collects information on the proportion of children participating in physical education and school sports. During the academic year 2007/08, 90% of pupils in all schools took part in at least 2 hours of high quality PE and sport at school each week, an increase from 62% in 2003/04. The largest improvement was seen in primary schools where the levels of participation in 2007 were 96% of all pupils (DCFS, 2008). In 2009/10 64% of pupils in

primary schools took part in 3 hours of high quality PE and out of school sports in a typical week (HSCIC, 2010).

A study by Reilly *et al.* in 2004 on the activity levels of pre-school children showed that three-year old children were inactive for 80% of the day.

The changes in dietary intake, eating and activity patterns of children in the UK are due to a range of factors. The term 'obesogenic environment' has been used over the last decade to describe the role environmental factors such as changes in food production and modes of transport play in determining energy intake and expenditure.

### 1.3.4 Theme 4–Food production

In the UK on average about 10% of household income is spent on food, but for those in low income households this increases to 23%. There is at present an abundance of food that is widely available; food technology has enabled food to be produced cheaply, these processed foods tend to be energy dense and widely promoted. It has been postulated that the increase in obesity seen in almost all counties is driven by changes in the global food system (Swinburn *et al.,* 2011). The consolidation of many small food industries into a few large companies has influenced nutrition patterns globally and is thought to have influenced the increased proportion of foods eaten outside the home (Maziak *et al*., 2008). In 2006 it was estimated that 12% of energy was obtained from food eaten out of the home (DEFRA, 2008). In the USA the proportion of foods that children consumed from restaurants and fast food outlets increased by 300% between 1977 and 1996 (St-Onge *et al.,* 2003). Exposure to poor quality food environments was shown to have an effect on the

eating patterns of adolescents; those who attended schools with close proximity to fast food outlets consumed fewer servings of fruit and vegetables and more servings of soft drinks and were more likely to be overweight (Davies and Carpenter, 2009).

### 1.3.5 Theme 5- Societal influences

Children's behaviour has been shown to be influenced by television advertising (Ofcom 2007, Dixon et al., 2007) and this occurs even when knowledge about healthy eating is good. Overweight children with low self esteem being more susceptible (Swinburn *et al*., 2004) despite social pressures which favour slimness. Children are living in a climate of obesity stigmatisation with media portrayal of the ideal body shape image. Studies have documented the prejudices against overweight which begin at a young age (Hill and Silver, 1995). Young children are vulnerable to body shape dissatisfaction (Wardle and Cook, 2005) and low self esteem (Strauss, 2000). Although the marketing of high, fat, salt and sugar foods on television on children's programmes has been regulated there has been an increase in press, radio, cinema and internet advertising (DH, DCSF 2008).

### 1.3.6 Theme 6- Individual psychology

Eating patterns have altered with more children grazing, snacking and eating outside the home and children are given more control over food choice (Wardle, 2007). It has been reported that families see giving children choice over food and activity as a means of empowering them (DH, DCSF 2008). Studies have reported conflicting evidence on the role of parental feeding style and its association with childhood obesity, Benton (2008)

suggests that parental feeding restriction was associated with greater weight in the child. Rhee et al. (2006) reported that risk of overweight in children aged 4.5 years was significantly higher among parents classed as permissive, neglectful and authoritarian parenting styles. Montgomery *et al.* (2006) did not find consistent evidence for this but they reported that parental concern over their child's weight status was positively correlated with the child's weight status. Other studies have shown that many parents fail to recognise their own or their children's weight status (Jeffrey et al., 2005, DH, 2010) and that they lacked awareness of the health risks associated with poor diet and obesity (DH, DCSF 2008). Parents tend to underestimate the influence they exert on children's food choices and many were reluctant to change behaviour as they equated happy children as healthy children.

### 1.3.7 Theme 7 -Activity environment

Physical activity in children has declined over recent years, partly due to advances in technology and safety fears of parents in allowing their children to play outdoors. Children are leading more sedentary lifestyles spending on average 5 hours and 20 minutes a day watching television and using a computer and eight out of ten children have their own television (Childwise, 2008). It has been proposed that television viewing impacts on childhood overweight in four ways: by replacing time spent on physical activity, promoting between-meal snacking, the influence of advertising on food choice and decreasing metabolic rate (Bryant *et al.,* 2007). Poor urban planning and lack of outdoor facilities has contributed to parental anxiety about safety of outdoor play. The role of the built environment on childhood obesity was reviewed by Maziak *et al*. (2007) and they

reported that people who live in areas with traditional or walkable design are more active than those who live in an area of suburban-type design. For children the presence of pavements and controlled intersections were found to be positively associated with physical activity whereas heavy traffic, crime and area deprivation were negatively associated with physical activity. Car ownership has increased and nearly half of children in 2006 travelled to school by car (Department for Transport, 2006). The most common barriers reported by parents on why children did not walk or cycle to school included long distances, traffic, bad weather and crime (Story *et al.,* 2006). Although the proportion of children participating in 2 hours PE and sport has improved in recent years schools in England allocate the lowest amount of time to physical education in Europe.

### 1.4 Children's eating habits

Children's eating habits are intrinsically linked with the rise in overweight and obesity. As previously mentioned evidence suggests that for many children intakes of saturated fat and sugars is high with potato products and savoury snacks contributing to 20% of the intake of total fat and children aged 7-10 years having the highest proportion of total energy from NME sugars (NDNS 2000). It has been suggested that the preference for savoury snacks seems to be associated with overweight in prepubertal children (Maffeis *et al.,* 2008). Poor dietary choices including high consumption of soft drinks, sweets and snack foods have been associated with a high BMI in children (Nicklas *et al.,* 2001). Some studies have found an association between poor nutritional quality of breakfast (based on a ratings score of 0-10, with a high score indicating a greater nutritional quality) with a higher BMI (O'Dea and Wilson, 2006), whereas other studies found no association (Rampersaud,

2009). Socio-economic deprivation is inversely associated with eating breakfast (Pearson *et al.,* 2009) and fruit and vegetable intake among children (HSCIC 2010). A review on the determinants of fruit and vegetable intake among children aged 6 to 18 years found a higher intake of fruit and vegetables in girls and younger children compared to boys and older children and that evidence suggested that socio-economic position, parental intake and home availability were positively associated with intake (Rasmussen *et al.,* 2006). Research on families' attitudes and behaviour relating to diet identified three family 'clusters' that required specific support to improve their children's diet, two of these were low income but the third were affluent families who over indulged in unhealthy snacks (DH, DCSF 2008).

### 1.5 Children's perceptions of body weight

In the developed world, the most immediate adverse effect of overweight and obesity in children is the impact on psychosocial wellbeing (Reilly *et al.,* 2003). Body shape dissatisfaction is recognised in adolescents (Cooper and Goodyear 1997). Caradas *et al.* (2001) found that body image dissatisfaction varied according to ethnic background with white girls having a greater level of body image dissatisfaction and Walker *et al.* (2003) reported that obese adolescents had greater body shape dissatisfaction than those of normal weight. Assessments of body satisfaction have also been investigated in pre-adolescent children (Parkinson *et al.*, 1998, Hill *et al.,* 1994, Gualdi-Russo *et al*., 2008). The HSE 2007 (HSCIC 2008a) reported that 73% of children aged 8-15 years considered they were about the right weight with only 16% stating they were 'too heavy'. Nearly

three quarters of those categorized as overweight considered they were the right weight as did nearly half of those categorized as obese.

### 1.6 Theoretical basis of behaviour change strategies

Guidance providing generic principles to be used for public health activities aimed at changing health-related behaviour was issued by NICE in 2007. This gave recommendations on planning, delivery and evaluation of any intervention or programme aimed to help people change their behaviour (NICE, 2007). Darnton (2008) in a review of behaviour change theory proposed that to develop effective approaches to behaviour change it is necessary to understand the factors that influence behaviours (models of behaviour) and how these behaviours can change over time or be changed (theories of change). Most models of behaviour change are built on the principle that individuals behave rationally and behaviour is based on a decision making process. Individual-level models such as learning theories tend to focus on specific food choice behaviours and include exposure to new foods, reinforcement or use of incentives, modelling of behaviour and self monitoring. Social-psychological models incorporate a wide range of influencing factors on behaviour change: these include attitude, norms and agency, where attitude is perceived as a belief about behaviour, social norms act as a guide on how to behave and agency (or self efficacy) the sense that an individual can successfully undertake the behaviour.

The Social Cognitive Theory (SCT) is a learning theory which is based on the concept of reciprocal determinism where there is constant interaction between three factors; cognition, behaviour and social and physical environment (Bandura, 1986). SCT also

gives emphasis to the human capacity for collective action so that individuals can work together in social systems to achieve environmental changes that benefit the entire group. The SCT concept includes nine constructs; environment, behavioural capacity, expectations, expectancies, self-control, observational learning, reinforcements, self efficacy and emotional coping. McAlister et al., (2008) grouped the concepts into five categories: psychological determinants of behaviour; observational learning; environmental determinants of behaviour; self regulation and moral disengagement. As the theory is broad it may not be possible to include all constructs in any health promotion intervention and selected constructs are widely applied. Concepts of SCT from the five categories that are frequently used include outcome expectations, self-efficacy (social modeling, verbal persuasion), observational learning, environmental change (through incentives and facilitation) and self regulation (through self monitoring and goal setting).

Behaviour change is often influenced by societal factors such as technology and economy and an example of the societal model often used in health promotion is the Main Determinants of Health model (Dahlgren and Whitehead, 1991).

**Fig 5 Main Determinants of Health Model**


Source: Dahlgren G, Whitehead M. (1991) Policies and strategies to promote social equity in health. Stockholm, Institute for Future Studies.

Theories of change include the Transtheoretical ('stages of change') model developed by Prochaska and Diclemente (Prochaska and Velicer, 1997) which proposes that behaviour change occurs in stages with individuals moving through the stages in a cyclical or spiral pattern that involves both progress and periodic relapse. They also suggested that behaviour change can only take place in an enabling and supportive environment. Environmental models are based on the environmental influences that affect behaviour and these can be divided into internal and external influences. Worsley (2007) summarised these into internal influences (e.g. taste and satiety) and external influences (e.g. family socialisation and marketing of foods). The external influences can be further subdivided into microenvironmental (e.g. homes and schools) and macroenvironmental (e.g. media

and transport system) settings. The Precede-Proceed model includes a combination of individual and environmental factors and is used in health promotion.

### 1.7 Behaviour change strategies and primary school children

The majority of the behaviour change models have been developed with adults. Children have less autonomy on their food choices and it is thought that environmental determinants may be more important determinants of their nutrition behaviour than personal determinants. Brug and Klepp (2007) described the determinants of nutrition behaviours in children and three distinct categories of determinants were identified; motivation, ability and opportunity.

A common feature of the theories including the Health Belief Model, the Theory of Planned Behaviour and Social Cognitive Model is motivation or intention as a primary determinant of behaviour. Motivation can be predicted by attitudes, perceived social influences and self efficacy. Attitudes are based on consequences and outcomes of behaviour, for children short-term outcomes are more important than long-term outcomes (Thomas *et al.*, 2003). Perceived social influence includes subjective and descriptive norms and social support, in children modelling by parents and important others has been shown to be associated with children's intake (Reinaerts *et al.*, 2007). In children self efficacy is associated with healthy food choices (O'Dea and Wilson, 2006). Skills and ability is dependant on knowledge and is important in improving motivation to change, for children who depend on others for their food choices, skills to influence the decisions may be relevant. Children depend on the opportunities in the environments they live in to make

healthy choices, environments that offer opportunities for healthy eating may improve motivation to do so. Parents are gatekeepers to the provision of food to their children and regulate the accessibility of food in the home and children are unlikely to be provided with food that their parents dislike, however it is has been shown that most mothers respond to requests from their children (aged 8 to 15 years) to purchase food products (Jebb *et al.,* 2007).

Few school-based interventions from international settings provide specific details on behavioural theory in their publications. One behavioural theory used in the school setting is the social cognitive theory (Bandura, 1986); this proposes that behaviour change is determined by an individual's self-efficacy and their perceived value of the outcomes of behaviour change (Sharma 2006). Aspects of behavioural change included in school-based interventions include skills building (Warren *et al.,* 2006), role modelling (Caballero *et al.,* 2003), self evaluation (Gortmaker *et al.,* 1999a), goal setting and self monitoring (Muller *et al.,* 2001).

Five effective elements to include in adolescent school health promotion programmes identified by Peters *et al.* (2009) are:

- use of theory, with specific reference to social cognitive theory,
- addressing social influences, especially social norms,
- addressing cognitive-behavioural skills,
- training of facilitators,
- including multiple components.

### 1.8 Factors influencing food choice among primary school children

In a review by Swinburn *et al.* (2004) the home environment was deemed to be the most important setting that influences children's eating and activity behaviour. Factors that influenced behaviour were availability and exposure to a range of fruit and vegetables and the mother's nutrition knowledge, attitudes and behaviour. The reduced exposure of children to cooking skills and the use of food as a reward or restricting their availability increases preference for those foods. Role modelling by peers and parents also influences children's behaviour, parents who engage in healthy behaviour with their children are more likely to have children who display healthy behaviour (Pearson *et al.*, 2009). Co-occurrence of healthy and unhealthy behaviour exists in children (Sabbe *et al.*, 2008).

Primary schools are particularly suitable for programmes that effect behavioural change as there is the potential to affect behaviours of children that persist into adolescence and adulthood (Barlow and Dietz, 1998). During this time development of physical skills, food preferences and independent behaviours occur in children and this provides an opportunity to influence behaviour. Schools can promote healthy lifestyles by providing healthy meals, physical education lessons and activities during playtimes, classroom health education and school health services (Story *et al.*, 2006). The majority of children aged 5-16 attend school and a familiar environment together with support of teachers and peers is thought to strengthen the nutrition promotion message. Peer influences on nutrition behaviour and modelling by teachers has been reported but for children aged 6-12 years the results are conflicting and currently they are considered to be less important than parental influences (Brug and Klepp, 2007).

A range of factors influence children's food choice and activity levels (Dietz and Gortmaker, 2001).

At school these factors can include:

1. the curriculum – this can influence child and parent knowledge, attitude and belief,
2. the type of physical education lessons offered,
3. food choice,
4. community- safety issues around walking to school.

Family factors also play an important role, these include:

1. role of parent in influencing food choice,
2. behaviour patterns- television viewing etc.,
3. socio-economic class.

A review on the barriers and facilitators to healthy eating by the EPPI-Centre in 2003 (Thomas *et al.*, 2003) found that there were six contextual issues that should be considered when designing programmes to promote healthy eating in children:

1. children do not see it as their role to be interested in health,
2. children do not see messages about future health as personally relevant or credible,
3. fruit, vegetables and confectionery have very different meanings for children from adults,
4. children actively seek ways to exercise their own choices regarding food,
5. children value eating as a social occasion,

6. children see the contradiction between what is promoted in theory and what adults provide in practice.

The review suggested effective interventions would make healthy food choices accessible, involve family and peers and address personal barriers to healthy eating. Interventions that did not emphasise the health benefits of fruit and vegetables were found to be more effective than those which did. A systematic review on the barriers and facilitators of healthy eating among young people conducted by Shepherd *et al.* (2006) found that barriers to healthy eating included poor school meal provision and personal taste preferences for fast food and facilitators included support from family, wider availability of healthy foods and concerns over appearance.

With regards to physical activity successful interventions should include modified PE lessons, making physical activity a social activity, increasing children's confidence and improving access to physical activity opportunities. Improving children's awareness of their sedentary behaviour e.g. television watching should also be included.

The role of schools in obesity prevention was reviewed by Story *et al.* (2006) who concluded that in the USA obesity could be prevented if schools worked together with policymakers, parents and communities to provide an environment where children eat healthily, were physically active and developed lifelong habits that contributed to a healthy lifestyle. In the UK NICE, (2006) has recommended that schools can help prevent overweight and obesity by adopting a whole-school approach through the National Healthy Schools Programme (NHSP), with all schools offering access to extended schools by 2010. The NHSP has 4 core themes; personal and social and health education, healthy

eating, physical activity and emotional health and well-being. Guidance on how the Healthy School themes support obesity prevention is available (DH, 2007).

### 1.9 Public health prevention strategies

There is widespread agreement that prevention of obesity requires a multi-factorial approach but there is little conclusive evidence at present to identify how this should be delivered (Butland *et al.*, 2007). An example of a current public health approach is the EPODE study, which is a community-based programme aimed at preventing childhood obesity in over 130 towns in France (Epode, 2009). This involves public and private sector initiatives with an emphasis on consistent health messages to enable behaviour change with the cost borne equally between the local government and industries. The North Karelia project in Finland was another community-based prevention strategy aimed at reducing levels of heart disease, this included health education and environmental changes over a period of 20 years and had a successful outcome (Puska *et al*., 1995). In the USA community-based childhood obesity prevention environmental nutrition interventions (CCOPENIs) have been found to be effective in altering obesogenic community behaviours in the short term. CCOPENI is a population-wide approach to alter community dietary behaviour by addressing community political, physical and economic food environments (Mayer, 2009).The small-changes approach has recently been suggested as a way of initially stabilising the obesity epidemic by promoting small changes in individual's diet and activity levels to prevent further weight gain. This, in combination with efforts to bring different stakeholders together to gradually decrease some of the

environmental factors that have contributed to excessive energy intakes and low levels of physical activity, can lead to a reduction in the prevalence of obesity (Hill, 2009).

A number of government initiatives have specifically targetted school-age children. The National Healthy Schools Programme, started in 2002, aims to make children, parents, teachers and the local community aware of the opportunities that exist in schools for improving health. In 2004 the healthy-living blueprint for schools was published by the Department for Education and Skills with the aim for all schools to become "healthy schools" focusing on 5 key objectives to improve health through every area of school life. The 5 key objectives were:

- To promote a school ethos and environment which encourages a healthy lifestyle
- To use the full capacity and flexibility of the Curriculum to achieve a healthy lifestyle
- To ensure the food and drink available across the school day reinforces the healthy lifestyle message
- To provide high quality Physical Education and School Sport and promote Physical Activity as part of a lifelong healthy lifestyle
- To promote an understanding of the full range of issues and behaviours which impact upon lifelong health

By 2009 all schools are expected to be participating in the programme with at least 75% achieving healthy school status. The Food in Schools Programme, school meals standards and school fruit scheme aims to improve the diet of children whilst at school (Department for Children, Schools and Families and Department of Health, 2006). To promote healthy weight through a whole school approach all schools are expected to offer extended school

activities by 2010. To allow analysis of trends in childhood obesity the National Child Measurement Programme was established in 2005, which aims to weigh and measure all children in reception year (aged 4-5 years) and year 6 (aged 10-11 years). Restrictions on broadcasting food and drink advertising of foods high in fat, salt and sugar to children under 16 years came into effect in 2008.

### 1.10 Government initiatives in the UK

Halting the rising prevalence of overweight and obesity in children is a public health priority (Healthy Lives, Healthy People, 2010). In 2004 The Department of Health gave a national target for halting the rise of obesity among children under 11 by 2010, this was revised in 2007 with a new ambition announced by the government to be *the first major country to reverse the rising tide of obesity and overweight in the population by ensuring that all individuals are able to maintain a healthy weight. Our initial focus is on children; by 2020 we will have reduced the proportion of overweight and obese children to 2000 levels*. This formed part of the public service agreement on Child Health – PSA 12: to improve the health and wellbeing of children under 11 (HM, Treasury 2007). In 2008 the government launched the Healthy Weight, Healthy Lives strategy, a sustained programme to support people to maintain a healthy weight (Cross-Government Obesity Unit, 2008). The five main policy areas of the strategy were: to promote children's health, to promote healthy food, to incorporate physical activity into lifestyles, to create incentives for better health and to offer personalised support for overweight and obese individuals. A national social marketing campaign Change4Life was launched in 2008 to support families to make healthier lifestyle choices.

## 1.11 Obesity prevention in children

### 1.11.1 Intervention Strategies

Several reviews have looked at the effectiveness of interventions in the prevention of childhood obesity for school aged children, these include Summerbell *et al.* (2005) and NICE, (2006). Sharma, (2006) reviewed international (excluding the USA) school-based interventions for preventing obesity in children. Brown and Summerbell, (2009) conducted a systematic review of controlled trials of school-based lifestyle interventions that focused on changes to dietary intake and physical activity levels. In the review by Doak *et al*. (2006) the criteria for effectiveness in school-based interventions for children aged six to 19 years was if a reduction in anthropometric measurements in the intervention group occurred.

Interventions identified for the prevention of childhood obesity in school-aged children can be categorised into either:

1. family–based interventions,
2. school-based programmes.

The outcome measures for these interventions included changes in weight, diet, activity or a combination of all three outcomes. The reviews concluded that most studies which combined diet and activity did not significantly improve BMI but that there was a small positive impact on weight gain with some approaches and nearly all resulted in some improvement in diet or activity. Most studies were of a short-term (minimum 3 month, maximum 1 year) duration and a few were long-term (1 year or more). Most of the research reviewed has been conducted in North America but the findings of the majority

of the studies could be translated to the UK population. An evaluation of the studies conducted in the UK together with other studies that were deemed effective are presented.

### 1. 11.1.1 Family- based interventions

Family- based interventions included health promotion programmes that focused on promoting healthy eating and physical activity and included sustained contact with children and parents. In a systematic review by McLean *et al.* (2003) out of the 7 interventions reviewed 5 showed no difference in weight outcomes and the effectiveness of the interventions for children aged 5-13 years was dependant on the number of behaviour change techniques taught to both parents and children. Studies ranged from using 4 to 11 behaviour change techniques and the most commonly used were goal or target specified, monitoring, contingencies for target behaviour and increasing skills. A study by Hopper (1996) with 9 and 12 year olds found diet and activity improved in the intervention group and that the results were correlated with the degree of family involvement. Family-based interventions can be effective in modifying diet and activity at least during the duration of the intervention.

### 1.11.1.2. School-based interventions

School-based interventions included programmes focusing on health promotion, diet, physical activity or multifaceted interventions. This section describes some of the school-based interventions that adopted a whole school approach and examined prevention of childhood obesity.

Many of the early school-based interventions conducted focused on improving diet and physical activity for cardiovascular health rather than specifically focusing on obesity. The majority of the evidence around the effectiveness of school-based interventions has been derived from studies conducted in North America, with only three randomised controlled trial (RCT) in the UK (NICE, 2006). The results of the trials are difficult to compare due to variable study designs and assessment tools, but there has been evidence of some success in preventing childhood obesity especially with multifaceted interventions. Most of the studies had positive outcomes related to diet and physical activity, if not on anthropometric measurements. Reported dietary changes were mainly increased fruit and vegetable intake or reduced fat intake and physical activity changes were increased self-reported activity levels. This was shown in both long term and short term interventions but it not clear whether these effects were maintained for any period after the interventions had finished. A systematic review to update the NICE guidance (Brown and Summerbell, 2009) on controlled trials of school-based interventions reporting weight outcomes concluded that the findings were inconsistent but suggested that combined diet and physical activity school-based interventions may help prevent children become overweight in the long term.

One of the largest intervention strategies focusing on primary schools was CATCH (outcomes of a field trial to improve children's dietary patterns and physical activity: the Child and Adolescent Trial for Cardiovascular Health) (Luepker *et al.*, 1996). This involved over 5000 children aged 8-11 years in 56 intervention schools and 40 control schools over a three year period in the USA. CATCH looked at health behaviour

interventions that included the school environment and classroom curricula and a proportion of the intervention schools also included a family-based programme. The primary outcome of the intervention was the prevention of cardiovascular disease, not obesity. The intervention resulted in modification of the fat content of school lunches and increased physical activity in PE lessons and self-reported improved eating and physical activity behaviours in children during three school years.

School-based prevention studies designed to be delivered by teachers can be grouped into 3 categories:

**1.11.1.2.1 Curriculum based activities to promote healthy lifestyles.**

'Planet Health' was a successful North American intervention study aimed at reducing obesity, (Gortmaker *et al.,* 1999a). This was a randomised controlled trial (RCT) study of over 1200 children aged 11-13 years with 5 intervention and 5 control schools. This study aimed to alter dietary intake (by increasing fruit and vegetable consumption and decreasing consumption of high-fat foods), increase activity and reduce TV viewing by incorporating classroom based activities within the existing curricula over a two year period. Concepts of SCT in the study included self evaluation and facilitation. Planet Health was associated with decreased obesity among girls in the intervention schools with adjusted odds ratio 0.45, with no differences found among boys. A reduction in television viewing in both boys and girls was also reported and in girls each hour of reduction in television viewing predicted reduced obesity prevalence. Increased fruit and vegetable consumption of 0.32 servings day was also noted in girls. It was suggested that the

differences observed between genders was due to the fact that girls were more responsive to the intervention because they were more attuned to issues of diet and activity.

#### 1.11.1.2.2. Curriculum based activities to promote healthy lifestyles plus modification of school meals.

A UK RCT study, APPLES (Sahota *et al.*, 2001), was a programme designed to promote healthy lifestyles in schools which was aimed at the whole school community and included parents, teachers, and catering staff. This involved ten schools with children aged 7-11 years over a one year period. The programme consisted of teacher training, modification of school meals, development of school action plans targeting the curriculum, PE, tuck shops and playground activities. There was no difference in BMI between the intervention schools and control, but a modest increase was seen in the consumption of vegetables.

'Pathways' was a RCT conducted in the US (Caballero *et al.*, 2003) which included over 1700 American Indian children aged 8-11 years in 41 schools. This was a multi-component intervention delivered by school staff, the 4 components comprised of reducing fat content of school meals, increasing physical activity, classroom curriculum focusing on healthy eating and family involvement programme. The study included the SCT concept of role modelling. No change was found in BMI, skinfolds or percentage body fat, although a trend was seen in increased physical activity in the intervention group. A reduction in calories from fat for the school lunch was observed and self-reported knowledge was improved in the intervention group.

A US study by Donnelly *et al.* (1996) involving 338 children aged 8-11 years in two schools aimed to alter the school menu (by reducing energy, fat and sodium), to increase activity and nutrition education modules. There was no impact on obesity, but HDL cholesterol was improved in the intervention schools. Any changes in diet and activity at school were compensated by changes outside school so that overall no differences were observed.

**1.11.1.2.3. Healthier food choices and increased physical activity.**

A 6 month study in Chile evaluating healthier food kiosks and increased physical activity in children aged 5 to 15 years showed improved fitness levels in the intervention children and improved BMI scores in boys (Kain *et al.*, 2004).

School-based prevention studies designed to be delivered by researchers or health professionals can be grouped into 3 categories;

**1.11.1.2.4 Nutrition education and physical activity sessions with some parental involvement.**

This included a UK RCT study, 'Be Smart' (Warren *et al.*, 2003); which involved 3 schools with children aged 5-7 years over 4 school terms. The study was based on SCT included the following concepts, expectations, expectancies, incentives and self-efficacy. Children were divided into 4 groups (nutrition group, physical activity group, combined nutrition and physical activity group and a control group). The intervention was delivered by a research team via lunchtime clubs and involved parents. There was no difference in

BMI between the groups, but significant changes in self-reported knowledge and improved diet and physical activity in the intervention groups. A limitation of the study was that the children recruited to the study were from families interested in health.

'KOPS' (Kiel obesity prevention study) is an ongoing 8 year follow-up RCT study conducted in Germany (Mueller *et al.,* 2001), the intervention included nutrition education and active breaks into the school curriculum. The study included developing knowledge, self monitoring and building personal autonomy. The course was delivered by a nutritionist and teacher, a family intervention was also offered to children at risk of obesity. The one year follow up data on 414 children aged 5-7 years in 6 schools showed no change in BMI between the intervention and control schools but a reduction in fat mass of children in the intervention schools. Self-reported knowledge had improved in the intervention schools.

**1.11.1.2.5. Nutrition education.**

Another RCT conducted in the UK evaluated dietary education versus control with 644 children aged 7-11 years in 6 schools (James *et al.*, 2004). This intervention was aimed to reduce the intake of soft, carbonated, drinks. No significant change in BMI z score was seen between the intervention and control schools. The mean percentage of overweight and obese children increased in the control schools by 7.5% compared to a reduction in the intervention schools of 0.2%. The consumption of carbonated drinks had decreased in the intervention schools and increased in the control schools. Two years after the completion of the studies further anthropometric measurements revealed the number of

overweight children had increased in both groups, although the prevalence was higher in the control schools the difference was not significant (James *et al*., 2007).

#### 1.11.1.2.6 Increasing physical activity.

The results from interventions aimed at increasing physical activity in children have been inconsistent in their effect on BMI. Studies that were effective in improving BMI for both boys and girls included a study that encouraged reduced television viewing over a six month period in 9 year olds (Robinson, 1999) and a 4 month physical activity intervention in 8 year olds (Stephens and Wentz, 1998). Interventions based on aerobic exercise sessions were found to have a positive impact on BMI in girls (Flores, 1995, Mo-Suwan *et al.*, 1998)

## 1.12 Effectiveness of intervention programmes

School-based interventions use different methods of determining effectiveness which make it difficult to compare outcomes. Also, reviews of interventions use different inclusion parameters which mean that the reviews suggest different components that should be included for effective interventions. The review by Doak *et al.* (2006) focused on identifying aspects of prevention programmes that were likely to succeed in reducing BMI if implemented on a large scale. They reported that the majority (68%) of the programmes were effective based on reduction in BMI or skin-folds for the intervention group. Effective studies were shown to include larger number of pupils, lower number of schools and were of a shorter duration. They also found that more of the non-effective studies were aimed at children aged 8-10 years, whereas interventions aimed at children

over 10 years found a similar proportion of non effective and effective interventions and a higher proportion of effective interventions in those aimed at children below 8 years of age.

Studies that included process evaluations as part of their study design found that promoting healthy eating can be an integral part of the school curriculum for 4-10 year olds, but to be effective, dedicated time and support from a wide range of people were necessary (James *et al.*, 2003). One theory for the failure of many preventative interventions is that they have targeted behaviour at the 'micro' level (individual children or schools) and have been unable to influence factors that affect weight at the 'macro' level (societal level), (Reilly, 2006). The review by Livingstone (2006) stated that the most successful interventions have been grounded in behaviour change theory and that social ecological models are particularly suited frameworks for health promotion interventions.

The intervention strategies reviewed found inconsistent findings on the effectiveness of multi-component school-based interventions on preventing weight gain but overall suggest that they may help prevent children becoming overweight in the long term (Brown and Summerbell (2009). Most interventions showed an improvement in diet, activity or self-reported knowledge of children. Studies that included parental involvement were more successful in influencing obesity parameters. These behaviour changes were seen in studies delivered by teachers or by researchers and additional professionals. Health promotion messages in the school setting need to tailor to the age group and be culturally appropriate.

Important nutrition messages included increasing fruit and vegetable intake and reducing consumption of sweetened drinks. Activity messages mainly targeted duration of physical activity and a reduction of television viewing. Few of the interventions were longer than one year in duration and any long term impact of the behaviour changes were not established.

### 1.13 Background to the current study

The increase in childhood obesity and its health consequences led to Bexley's Children's Fund programme addressing this issue in its delivery plan for 2002 with funding for a two year project on the prevention and treatment of childhood obesity. The Children's Fund was one of a range of measures aimed at "ending child poverty, tackling social exclusion and promoting the welfare of all children- so that they can thrive and fulfil their own potential," as set out in the Department of Health's Framework for the Assessment of Children in Need and their Families (1999).

#### 1.13.1 The Bexley context

Bexley is one of thirty-two London boroughs which make up the area of Greater London with its location shown in Figure 6. The south London borough of Bexley consists of 21 wards (Figure 7). In 2004 four wards in the north and east of the borough featured nationally within the top 20% of wards in England in terms of multiple deprivation, as defined by economic, housing and environmental indicators (Figure 8). These wards are also in the top 16% having high levels of child poverty (Bexley Primary Care Trust, 2005).

**Fig 6. Map of Greater London showing location of Bexley**


(Source: www.bexley.gov.uk accessed August 2005)

In 2004 there were 25,203 children aged between 5 and 13 in Bexley. Wards in the north of the borough had the greatest number of school-aged children and the highest number of children in need.

**Fig 7. Map of Bexley wards**

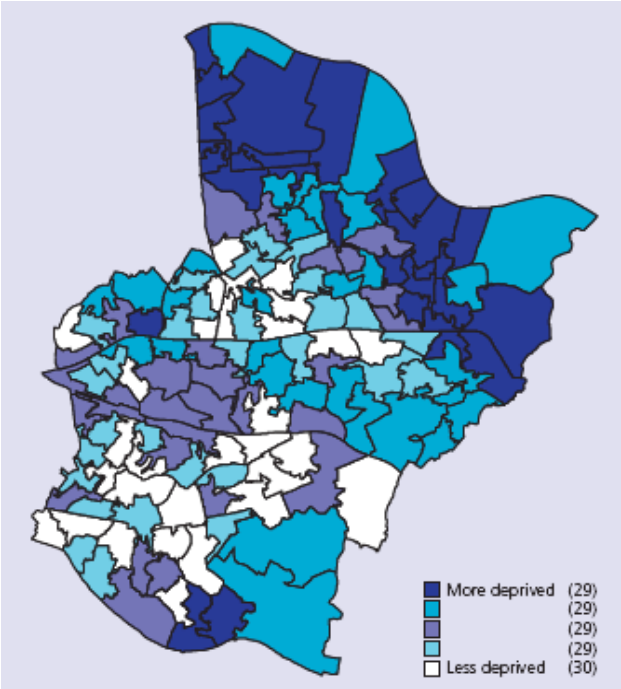

(source www.bexley.nhs.uk accessed August 2006)

### 1.13.2 Health and Education

Children from areas of social deprivation have health inequalities and poor educational attainment. For Bexley the poorest health occurred in the most deprived areas in the north and south of the borough (Erith, Thamesmead East and Cray Meadows) and a link was found between higher standard mortality rates and low incomes in these wards (Bexley PCT, 2005). Schools that were significantly underachieving at key stage 1 and 2 were also located in the most deprived areas in the north and east of the borough. The schools with

the highest percentage of children eligible for free school meals were located in these wards.

**Fig 8 Map of Bexley illustrating levels of deprivation in borough (index of multiple deprivation 2004)**




(Source: www.bexley.nhs.uk accessed August 2006)

An increased prevalence of childhood obesity is associated with social disadvantage. In the HSE 2002 (DH, 2003b) an inverse relationship was found between obesity prevalence and equivalised income quintile. Overweight and obesity in children were more common in the more deprived areas, amongst boys obesity prevalence was 4.5% in the least deprived quintile compared to 6.4% in the most deprived, in girls the corresponding figures were 4.5% and 8.8%. The prevalence of obesity in boys and girls aged 2-15 was higher in inner cities than in other types of areas.

This study on the prevention of childhood obesity was based in the wards in Bexley with the highest level of deprivation (although not an inner city area the surroundings represent this type of environment). When the study was initiated no specific data were available on the prevalence of childhood obesity in the borough and whether it varied from the national trend. Little information was available on the eating and activity patterns of primary school children in the borough.

Prevalence studies of obesity in children in the UK have identified increases in obesity with age, with the most marked increase being in the 8-10 year group which persists into adulthood. This age group is therefore of particular importance, it is at this period of development that children begin to have more autonomy over food choice, increasing peer influence on behaviours and increasing concern with appearance, but still exist in an environment where food access can be mostly controlled and there are extensive opportunities for education, motivation and skill development. For this study children aged 9-11 years were targeted as previous studies (Rudolf *et al.*, 2001) have shown they were cognitively able to complete questionnaires.

**Hypothesis**

1. A tailored school-based intervention will increase children's consumption of fruit and vegetables, breakfast and healthy snacks.
2. The response of children to the intervention will vary with individual characteristics of children including gender, BMI and body image.

**Aims:**

1. To develop, implement and evaluate a programme of educational intervention designed to increase consumption of fruit and vegetables, breakfast and healthy snacks.
2. To investigate whether the impact of the programme is influenced by a child's gender, BMI and perception of their body image.

**Objectives:**

- To conduct a baseline survey to describe the eating and activity patterns of primary school children aged 9-11 years in Bexley.
- To survey and identify the prevalence of overweight and obesity among children aged 9-11 years in Bexley.
- To examine children's eating habits and the role of
  - Gender
  - BMI
  - Satisfaction with body shape
  - Control over food choices
- Develop a tailored education programme in line with key stage 2 of the National Curriculum based on results of the baseline.
- Evaluate the impact of the intervention on changes in eating habits, focusing on
  - Breakfast
  - Fruit and vegetables
  - Healthy snacks.
- Evaluate whether the impact of the intervention is influenced by children's gender, body shape and body dissatisfaction as an aspect of well being.
- Conduct process evaluation of the intervention.

# CHAPTER 2

# MATERIALS AND METHODS

## 2. Methodology and Methods

This chapter provides the rationale for the study design and provides details of the method and tools used in this study.

The study aim was to assess the eating and activity patterns of children aged 9-11 years and to examine the role of gender, BMI, body shape and control over food choice on children's eating habits. The information from the baseline survey would be used to develop a tailored education programme based on concepts of behaviour change theories to increase children's ability to apply the principles promoted by the programme to choose a healthy diet. The intervention of this study was designed to be delivered by schoolteachers so that if successful would be sustainable and could be delivered as part of the health promoting schools approach. The intervention was designed to enhance the healthy school programme and not displace other activities at school so that it could become a permanent part of the school experience (Moreschi, 2006). The cost of the resources was also kept to the minimum to prevent cost being a limiting factor to continued use.

The main outcome measures of this study were assessed by collecting data on diet, physical activity and psychological well-being of children of the same age by means of a questionnaire at baseline, following the intervention and 1 year later and comparing results within schools and between the intervention and control schools. Prevalence of overweight and obesity was also determined at baseline and following the intervention in both intervention and control schools.

## 2.1 Survey materials and methods

### 2.1.1 Ethical approval

Following approval by the Bexley and Greenwich Research Ethics Committee (BGREC/06/JAN/04) and local education officer, all 16 primary schools in the most deprived wards of the borough were contacted during the autumn term of 2003 to take part in the baseline survey. Following discussions with the schools 10 schools agreed to participate in the survey. One school then withdrew from the study on the day of data collection.

## 2.2 The participants

All pupils in years 5 and 6, aged 9 to 11 years from the 10 schools were invited to participate in the survey, approximately 830 children were enrolled in those school years. Following the withdrawal of one school the number of children eligible to participate in the study was approximately 770.

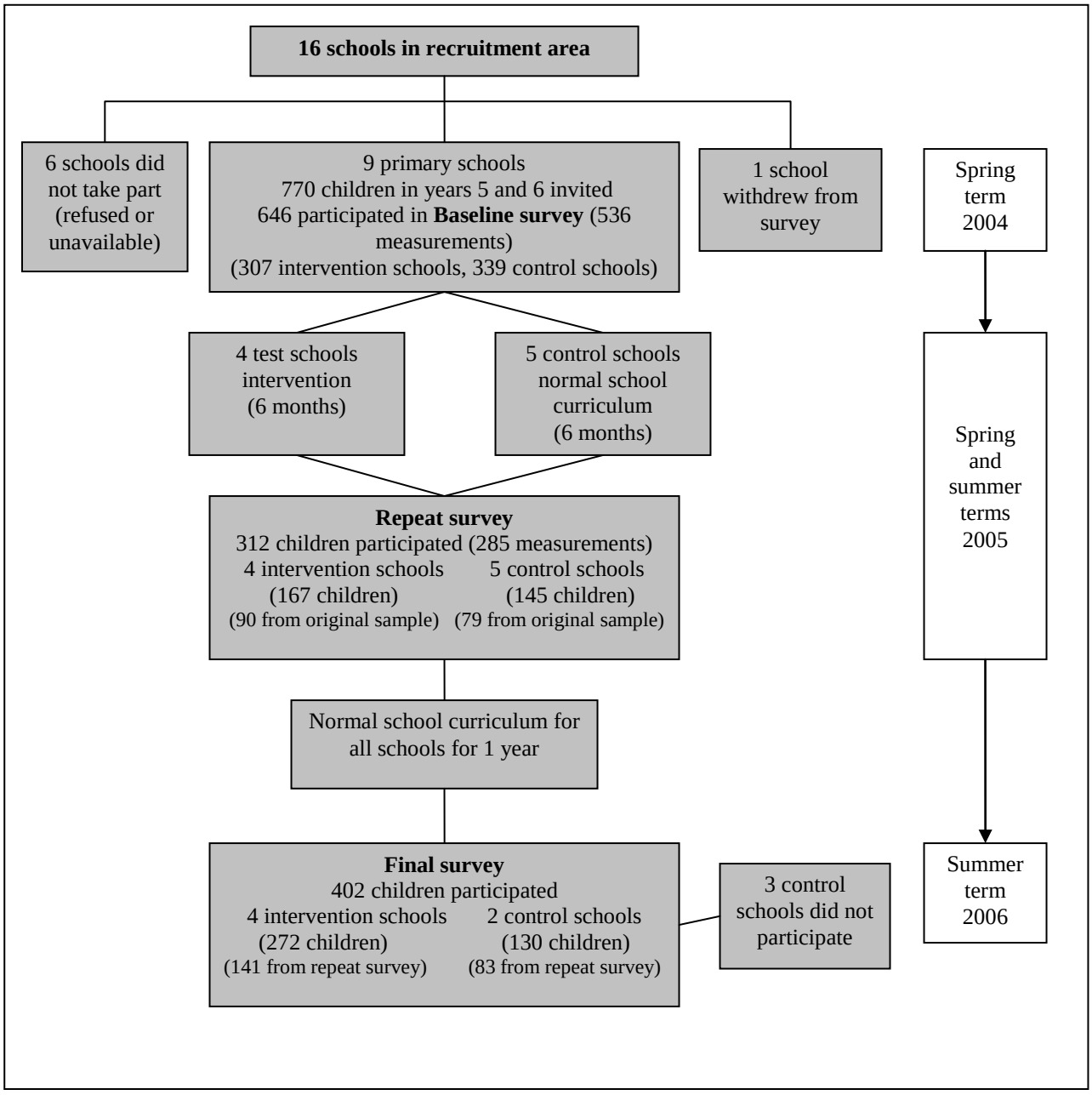
## 2.3 Study design

The study was a series of cross sectional surveys undertaken in nine schools which were divided into test schools (4) which received the intervention and control schools (5) which did not. In summary the study consisted of

- Baseline survey in all schools
- Intervention in 4 schools for 6 months with 5 schools acting as controls
- Repeat survey in all schools at the end of the 6 month intervention
- Final survey in all schools 1 year after the end of the intervention period

The study design is represented as a flow chart in Figure 9.

**Fig 9 Flow chart of study design**




The time frame for the study is shown in detail in Table 2.

**Table 2 Time frame for study**

| Year | 2003 | | | 2004 | | | | | | | | | | | 2005 | | | | | | | | | | | | 2006 | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Month | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D | J | F | M | A | M | J | J | A | S | O | N | D | J | F | M | A | M | J | J |
| Devise study | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Recruit schools | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Seek ethics approval | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Parental consent for baseline study | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Baseline survey** in 9 schools | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Analysis of data | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Feedback to schools | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Plan and design intervention | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Recruit schools | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Parent questionnaire | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Intervention** in 4 schools | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Parental consent for repeat survey | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Repeat survey** in 9 schools | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Analysis of data | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Feedback to schools | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Recruit schools for final survey | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Parental consent for final survey | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Final survey** in 6 schools | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Start analysis of all data | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

## 2.4 Recruitment

Prior to each survey it was necessary to recruit schools and also obtain parental consent for the children in years 5 and 6 to participate in each survey. Information letters about the study and consent forms were sent to parents via the schools and consent forms returned to the schools before each survey. For the final survey the local ethics committee agreed that a passive consent form could be used as no measurements would be undertaken. Copies of the letters to schools and parental consent form are included in appendix 1.

Prior to the intervention national and local initiatives that target primary schools and aimed at improving diet were identified. A brief questionnaire was included with the letters to school requesting information on their schools involvement in any initiatives that aimed to change children's eating or activity behaviour.

To maintain anonymity each child was given an identification number for measurement and questionnaire details.

## 2.5 Evaluation and control

It is essential that health promotion programmes include evaluation as part of the design. Several types of evaluation can be used and the PRECEDE model described below includes elements of three types of evaluations:

- Impact evaluation, assesses interventions are producing desired outcomes correlated with resources and cost,
- Process evaluation, assesses the effectiveness of programme implementation,
- Outcome evaluation, outcomes are measured.

The PRECEDE-PROCEED model of health promotion is a nine phase model that combines individual-level factors such as attitudes, perceived barriers to change with environmental influences on change.

The PRECEDE (Predisposing, Reinforcing and Enabling Constructs in Educational/Environmental Diagnosis and Evaluation) is the diagnostic and needs assessment phase of the theory and the PROCEED (Policy, Regulatory, and Organisational Constructs in Educational and Environmental Development) is the planning, implementation and evaluation phase.

The nine phases are,

Phase 1-3 social, epidemiological, behavioural and environmental diagnosis

Phase 4 educational and organisational diagnosis

Phase 5 administration and policy diagnosis

Phase 6 implementation

Phase 7 process evaluation

Phase 8 impact evaluation

Phase 9 outcome evaluation

Elements of all three types of evaluations (process, impact and outcome) were incorporated into the study design.

### 2.5.1 Process evaluation

Process evaluation of the project was included to determine whether the intervention was delivered as planned. All teachers delivering sessions in the intervention schools were

asked to complete an evaluation form for each session which was included in the **Be healthy** pack. All teachers involved in the intervention were also invited to participate in a face-to-face interview at the end of the intervention to discuss aspect of the intervention that worked well or aspects that could be improved. A questionnaire on programme delivery was also sent to all headteachers to confirm whether all aspects of the programme were delivered in their school.

### 2.5.2 Impact and outcome evaluation

Impact and outcome evaluations were determined to assess the effect of the intervention on behaviour change in the short-term and longer-term. The main outcome measures used in the study included:

- Changes in specific eating habits
  - Fruit and vegetable intake and eating habits at breakfast and snacks
- Assessment of nutritional knowledge
  - Importance of breakfast, recommended intake of fruit and vegetables and healthy snacks
- Assessment of body dissatisfaction
  - Body silhouette charts used determine discrepancy between perceived and desired shape
- Assessment of psychological well being
  - Visual scales and questions to determine overall well being and verbal bullying
- Anthropometry
  - Height and weight to calculate BMI

The data was collected at baseline, following the intervention and 1 year later and comparing the results within schools and between the intervention and control schools. Anthropometric data was used to determine prevalence of obesity at baseline and following the intervention in both intervention and control schools.

The precise outcome measures used in the study are described in section 2.6.2, 2.6.2.2, 2.6.3, 2.6.4.1.1, 2.6.4.2.1.2 and 2.7.1.

### 2.5.3 Confounding factors

In this type of action research the outcome measures are often affected by factors beyond the control of the study design, e.g. when working with schools, children's behaviour will be influenced by many other areas either within the school or outside the school premises. Prior to each survey a questionnaire was sent to each school to assess any changes in school policy, after school clubs or involvement in any initiatives that could impact on the diet or activity patterns of children. To determine if any findings were a direct result of the programme any messages about food directly involved in the school setting were recorded and compared between intervention and control schools. Messages about food in the media and advertising could also impact on the findings but these are more difficult to assess and would affect all schools. An example of media effect was the national television and press coverage by celebrity chef, Jamie Oliver that occurred during the study period who focused on the poor quality of school meals.

For health promotion programmes the use of randomised, blinded, control trials is often not an option due to the visibility of the health promotion taking place. Contamination was

prevented as much as possible by separating intervention and control schools to distinct locations within the borough.

### 2.6 Assessment of eating and activity patterns, body shape and well being

There are different methods of collecting data on eating and activity patterns, body shape dissatisfaction and well being. When choosing the appropriate assessment tool to use in this study the issues considered included:

- The objectives of the assessment,
- Complexity of information to be collected e.g. eating habits versus nutrient intake,
- Level of compliance, age and time factors of respondents,
- Practical aspects of data collection.

After a review of the methods available for measuring eating and activity patterns, body shape dissatisfaction and well being (described in sections 2.7.1, 2.7.2 and 2.7.3) it was decided to collect information on these aspects by means of a questionnaire as this fulfilled the requirements of this study.

#### 2.6.1 Questionnaire methodology

The questionnaire was designed to collect demographic data of children and self reported eating and activity patterns, body shape satisfaction and well being. The questionnaire was developed that could be completed in one lesson period of 30 minutes by the children while at school under the guidance of their teacher. The questionnaire was designed to be easy to complete using simple vocabulary and involved ticking choices from a range of answers with only two open questions on favourite foods and activities outside school

hours. The visual appearance of the questionnaire was aimed to appeal to young children with the use of artwork and adequate 'white space'. The questions followed a logical sequence of daily activities to minimize prejudice of response by the order of the questions. The ease which the questionnaire could be completed was tested on children aged 9-11 from a local school which resulted in minor adjustments made to the wording of some questions.

The questionnaire was divided into three sections (appendix 2).

### 2.6.2 Section 1- Assessment of eating patterns

This study aimed to assess the eating patterns of children using an assessment tool that could be completed by children. A food intake questionnaire (FIQ) was considered to be an appropriate tool for children as self-reported methods of dietary assessment have been used with children aged 9-11 years who are considered to have the cognitive skills necessary to complete simple FIQ (Luepker *et al.*, 1996).

A FIQ does not normally measure nutrient intake but is used to measure eating habits over a specified period, normally longer than 24 hours. Also a FIQ does not specify the time or quantity of foods consumed during the previous day. Several FIQ have been used to assess the eating habits of children, the youth-adolescent questionnaire (YAQ) (Rocket and Colditz 1997) has been used to measure children's diets in this age group and they concluded that self administered FIQ has a reasonable ability to assess eating habits in older children. Most FIQ used in studies on children have been used in conjunction with

other methods of assessment e.g. food diary or recall and completed by parents on behalf of the children (Warren *et al*., 2003, Gortmaker *et al.,* 1999a, Emmett, 2009).
Several studies in the UK have used a validated FIQ completed by children (Johnson *et al.*, 2001) and one study by Hackett *et al.* in 2002 used an adapted version of this FIQ with children aged 9 and above. The FIQ provided children with a list of 44 foods to choose that they may have been consumed over the previous day. Some foods were identified as positive or negative marker foods; these represented foods that children would either be encouraged to eat more of (positive marker) or less of (negative marker). When used with young children a basic level of literacy and knowledge of technical information e.g. identifying types of spread, milk was identified as a limiting factor to using this type of FIQ with young children. Cognitive skills needed to complete FIQ are reported to be lacking in young primary school children (Rockett *et al.*, 2003).

For this study a questionnaire was designed based on a FIQ with reference to general food items including positive and negative marker foods and also including reference to timing and frequency of food intake adapted from the day-in-the-life questionnaire developed by Edmunds and Ziebland, (2002). Responses were generally limited to ticking boxes on the questionnaire, questions were kept short and included the use of visual stimuli because of the young age of some of the respondents and to take into account their stage of intellectual development (Fuchs, 2009). This section included questions on eating patterns and the consumption of snack foods. The children were provided with a choice of foods for each meal which included some positive and negative marker foods identified in a previous study (Hackett *et al*., 2002). A high proportion of negative marker foods were

chosen as the NDNS has shown age-related differences in intake with younger children eating more biscuits, sugar confectionery, savoury snacks and fizzy drinks and more of the least- desirable foods were consumed in the least-affluent areas. These foods were also chosen as the study was particularly interested in whether the intake of these foods would be affected by the intervention. A question on who decided what was eaten at the main meals was also included, as some studies have shown that children perceive they have considerable influence on food choice (Robinson, 2000, Hart *et al.*, 2002). To determine if improved nutrition knowledge had any affect on behaviour an additional section on nutritional knowledge was included in the repeat and final survey. This would be used to compare nutrition knowledge in both types of schools in the short term (immediately after the intervention) and longer term (1 year later). (Appendix )

#### 2.6.2.1 Alternative methods of assessing eating patterns

Several alternative methods of assessing eating patterns were considered and the reasons why they were not used are described below.

***Weighed intake***

Although a 7 day weighed intake is considered to be the most reliable assessment of diet, no study was found using this method with large numbers of children.

***Food diary***

This method of determining dietary intake is considered to be a more accurate method of dietary assessment and is used to determine nutrient intake, a detailed record of all food

consumed is completed over a specified time span, normally 3 to 5 days. Food diaries have been used in several studies to assess children's dietary intake (Bogaert *et al*., 2003) and are often used in conjunction with other assessment methods (Sahota *et al.*, 2001). When assessing children's diet the diaries are completed by parents and are a demanding task, Sahota *et al*. 2001 found that food diaries had quantitatively and qualitatively low completion rate. Parents cannot accurately record food eaten by children at school and self-reporting by children is also needed. Studies have found that completing food records may also change eating behaviour (Rockett *et al.* 2003). Food diaries were not used in this study as input from parents was necessary and the assessment tool was to be completed by children.

***Dietary recall***

Recall by individual interview (Gortmaker *et al*., 1999b) and recall based on a checklist of possible foods eaten at each meal (Luepker *et al.*, 1996, Sahota *et al*., 2001) have been used with children. Dietary recall has been reported to need 20- minute sessions with each individual and does not require children to be literate. A study by Baxter in 2009 comparing methods of dietary recall in children aged 9-10 years, found inconsistencies between interviews and overall poor accuracy; they reported a sex differential with the use of prompts during recall, an increased accuracy with a target period of the previous 24 hours rather than previous day and under-reporting in overweight children. The capacity to conduct dietary recall with the number of children in this study was not available.

***Technology based assessments***

The use of technology in dietary assessments is under development. A study on the use of a camera or personal digital assistant (PDA) to assess dietary intake has proven to be popular with adolescents (Boushey *et al*., 2009). Children aged 5-6 and 10-11 years have been shown to be able to estimate portion sizes using food photographs and computer-based portion size estimation programmes (Foster *et al.,* 2009). A web based dietary recall has recently been used with children (Moore *et al*., 2008). At the time of the survey access to the technology required for this method of assessment was not available.

### 2.6.2.2 Assessing nutritional knowledge

To determine if improved nutrition knowledge had any affect on behaviour it was decided to include a section on nutritional knowledge in the repeat survey. Measurement of nutrition knowledge has been used in other health promotion studies with school aged children. Measurement of nutritional knowledge in any age group is not easy and a range of approaches have been used. Warren *et al.* (2003) used a modified nutrition questionnaire with children aged between 5 and 7 years, which consisted of eight matched photographs of food which the children were shown and they had to select the healthy option from each matched pair of photographs. This assessment took 10 minutes to administer and required the input from a researcher or adult. Due to the constraints of the study it was not possible to include this assessment in the questionnaire. In recognition of the cognition of the respondents three additional questions on specific areas targeted in the intervention were added to the questionnaire, (importance of breakfast, recognizing healthy snacks and recommended portions of fruit and vegetables). This allowed a means

of assessing nutritional knowledge focused specifically on the key message of the intervention and were added to the repeat questionnaire and also included in the final survey.

### 2.6.3 Section 2- assessment of activity patterns

Tools for measuring physical activity in children can be divided into either measurement obtained via self assessment tools or using objective methods. As the tool to be used was to measure general activity patterns of children and not duration and intensity of activity a questionnaire was deemed to be an appropriate tool to use with children of this age group.

Several types of questionnaires have been used to determine activity patterns of children, not all questionnaires have been validated and many have been adapted from physical activity questionnaires used with adults. The questionnaires vary depending on the age of the children studied, from basic questions aimed at the school day together with a questionnaire to parents (Warren *et al*., 2003), frequency of activity questionnaire (Sahota *et al.,* 2001) and questionnaires aimed at estimating the duration of moderate and vigorous physical activity levels over a month, (Gortmaker *et al.,* 1999a). A self administered physical activity checklist (SAPAC) was used in the CATCH programme to record time spent on physical and sedentary activities that included television watching and video games by 10-11 year olds (Luepker *et al*., 1996). Questions on frequency of physical activity and duration of sedentary activities were used by Veugelers and Fitzgerald 2005 with children aged between 10 and 11. Separate questions on television and video viewing

using an 11 item measure to determine total hours per day viewing have also been used with children (Gortmaker *et al*., 1999a).

As this questionnaire was to be completed by young children it was possible to include detailed questions on activity during the school day as very young children have been shown to be able to answer this type of question (Warren *et al*., 2003). Questions on physical activity patterns outside school and questions regarding sedentary pursuits e.g. television viewing and computer game use were of a more general nature.

#### 2.6.3.1 Alternative methods of assessing activity patterns

The alternative methods of assessing activity considered and the reasons for not using them in the study are described.

***Diary***

In a study by Bogaert *et al*. (2003) a physical activity record was completed by parents where each day was divided into 96 periods of 15 minutes and activities categorised into 9 variables depending on intensity with children 6-9 years of age. The amount of time in each category was then calculated for each day. The three day activity diary was previously shown to be a reliable tool when first test and 6-10 day retest was used. It has been reported that documenting frequency, duration, type and intensity of physical activity is difficult for this age group. Other limitations of using a diary are possible over-reporting and under-reporting of physical activity.

### *24 hour recall*

An alternative is for each child to describe their physical activity in the preceding 24 hours to interviewers (Gortmaker *et al*.,1999a). All activities were categorised into 6 classes and time spent in each category recorded to the nearest minute. This was used together with a food and activity survey. Limitations of this method included possible bias of recall by students in the intervention schools as a consequence of the intervention. The study did not have the capacity for assessment by recall.

### *Motion sensors*

These include the use of pedometers and accelerometers that directly measure physical activity. Both are generally worn by the individual on a belt around the waist. Pedometers count steps taken to estimate distance walked and two types are available, mechanical or electric. Cheap mechanical pedometers do not provide accurate measures of physical activity whereas electric pedometers are reasonably accurate in measuring steps taken which can be used to calculate energy expenditure De Cocker at al. (2006). Pedometers do not provide accurate estimates of total energy expenditure because they cannot differentiate between intensity of activity, they are not considered to accurately predict energy expenditure in children because children's activities are seldom based on walking. Accelerometers use transducers to measure acceleration and deceleration of the body and are able to reflect intensity, duration and frequency of activity. Activity levels of young children were determined by using data from an accelerometer which was used during waking hours for 7 days (Reilly *et al.*, 2004), and also with 9-10 year olds in the SPEEDY study (van Sluijs *et al*., 2008). Accelerometers are considered to more accurately reflect

children's activity levels. Funding was not available to purchase electrical pedometers or accelerometers.

### 2.6.4 Section 3-subject characteristics and well-being

The third section included questions on ethnicity, age, body shape preferences and psychological well-being.

The ethnic descriptions were based on the standard format required by the Children's Fund and gave a choice of 10 options for the children to choose.

#### 2.6.4.1 Assessment of body satisfaction

This study aimed to investigate the extent of body image dissatisfaction on boys and girls in all weight categories as there is evidence to show that young children can show body shape dissatisfaction (Hill *et al.,* 1994) and that there are clear gender differences in the body shape perceptions of this age group (Parkinson *et al*., 1998). A desire of thinness has been reported in girls as young as six (Lowes and Tiggemann, 2003) and is not confined to obese children (Hill *et al*., 1994). Body dissatisfaction has also been found in boys but in contrast to girls some boys want to be heavier (Jones and Crawford, 2005). It is also important to ensure that any intervention does not have adverse effect on children's perceptions of body image.

Previous studies have used body silhouette charts alone or in combination with a mixture of eating-attitudes tests and body shape questionnaires to determine body shape concerns of children, Robinson et al. (2001). Tools to measure body-esteem include a scale of 24

simple statements devised by Mendelson and White (1985) which have been used with children as young as 7.

#### 2.6.4.1.1 Body silhouette charts

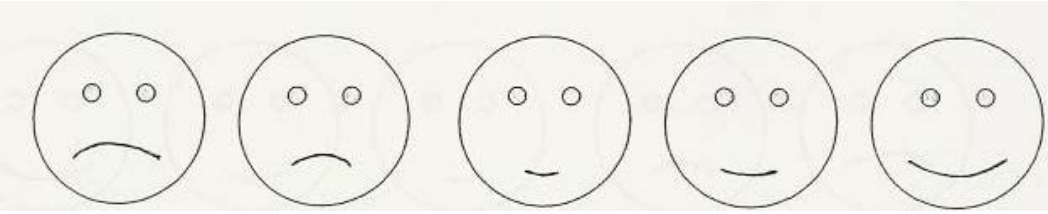
Several body silhouette charts have been used with children and adolescents (Bell *et al.,* 1986, Collins, 1991). These charts use a simple pictorial scale of 7 to 8 line drawings of male or female figures ranging in morphology from extremely thin to obese. Body silhouette charts have been used with children as young as 8 years old. Possible limitations of these silhouettes are that overweight children can underestimate their body shape and the possibility of socio-cultural influences on body shape (Gualdi-Russo *et al*., 2008).
It was decided to assess body shape satisfaction by the use of silhouettes alone in this study. This was because the questionnaires involved multiple statements with less than a quarter of the statements directly related to weight, also although they used a simple yes/no answer young children would take some time to complete this number of statements. The silhouettes chosen for this study were produced by Collins in 1991 for use with pre-adolescent children and have previously been used by Parkinson and Gualdi-Rosso in surveys with children aged between 8-13 years. Children were asked to select the silhouette that represented how they looked (perceived shape) and also what they would like to look like (desired shape). The Collins silhouette reported test-retest reliability coefficients for this age range was perceived 0.71 and desired 0.59 (Parkinson *et al.,* 1998). The discrepancy between the perceived and desired shape was used to determine the degree of body shape dissatisfaction as used by Phillips and Hill, (1998), Gualdi-Russo *et al.,* (2008) and Truby and Paxton in 2008.

### 2.6.4.2 Assessment of psychological well being

Assessment of psychological well-being was included in this study because overweight and obesity have a significant impact on well-being, with many children suffering from low self esteem and a higher risk of depression (Franklin et al. 2006). Most obese children also experience teasing and discrimination as a result of their weight (NHS CRD, 2002). It is also important to check that any intervention does not have negative impact on psychological well-being.

Due to the time constraints for completing the questionnaire it was not possible to use assessments that consisted of multiple items and a non-verbal scale was used to assess children's well-being in this study. Non-verbal scales may be used with children to assess well being and the faces scale has been used with children aged 3-15 years. The Faces Scale is a seven point scale consisting of stylised faces (Andrews and Witney, 1976), this was adapted for use in this study (Fig 10). Subjective well-being measures developed for use with primary school children by the New Economics Foundation (Thompson and Aked, 2009) include another version of a faces scale and an overall life satisfaction ladder. Children were asked to pick a face that represents how they feel about themselves.

**Fig 10 Non verbal Faces Scale used in study**



As obese children experience teasing due to their weight two questions were also included about their worries about verbal bullying, namely ‘called names’ and ‘made fun of’. Janssen *et al.* (2004) asked specific questions to measure the association between bullying behaviour and weight which included questions on verbal bullying.

***Alternative assessments of psychological well-being considered***

Several methods of assessing psychological well-being in children are available. Global assessment of well-being in children based on the 1985 Harter self-perception profile for children (SPPC) was used by Phillips and Hill, (1998) and Walker *et al.* (2003). This consists of a 36 item questionnaire covering five domains; scholastic competence, social acceptance, athletic competence, physical appearance and behavioural conduct, and a separate 10 item scale measuring the perceived importance of each domain. Coopersmith’s self esteem inventory, which has 58 items, was used by Hill *et al*. (1994) with 9 year old children.

A 10 point Likert scale was used by Walker *et al.* (2003) to distinguish worries about weight related issues in children. Questions were asked about 15 weight and non weight issues.

## 2.7. Anthropometry

### 2.7.1 Method of assessing obesity in this study

#### 2.7.1.1 Body mass index (BMI)

Measurement of height and weight to calculate Body Mass Index (BMI: weight in kilograms divided by the square of height in meters ($kg/m^2$) was chosen as a reliable indicator for the assessment of obesity for this study. The use of BMI to define obesity in children has gained international support. SIGN evaluated the effectiveness of using BMI as a screening tool by comparisons against reference measures of body fatness such as hydrodensitometry and dilution of the stable isotopes deuterium and oxygen and concluded that use of cut-off ranges for BMI is associated with high specificity and moderate sensitivity. SIGN in 2003 and 2010 recommended using BMI percentile to identify childhood obesity.

BMI increases normally in children as they grow until they reach adulthood and is different between boys and girls. Thus interpretation of BMI values need to be compared to population reference data, this means that there is no universally accepted BMI classification system. BMI was calculated and compared to national and international reference charts to determine the prevalence of obesity as this has been accepted as a means of identifying obesity in children.

The UK National BMI percentile classification (obesity as a BMI more than the $95^{th}$ centile and overweight as a BMI over the $85^{th}$ centile of the UK 1990 reference chart for age and sex) was used to define overweight and obesity in children and was used for any comparative analysis of data. The prevalence of overweight and obesity using the IOTF classification is also reported to allow comparison.

Although the use of BMI is accepted as an indicator of obesity it does not accurately reflect body composition as it does not differentiate between fat mass and fat-free mass nor does it reflect regional fat distribution.

#### 2.7.1.2 Anthropometric measurements

Body weight was measured at school to the nearest 0.1kg with Seca 770 portable scales, (calibration checked). The children were weighed clothed but without shoes and jumpers. Height was recorded to within 0.001m using the Leicester portable height measure. These measurements enabled BMI to be calculated for each child. Overweight and obesity were defined according to the IOTF (Cole *et al.,* 2000) recommendations and the UK National BMI percentile classification (Cole *et al.,* 1995).

### 2.7.2 Alternative methods of assessing obesity

Two alternative methods of assessing obesity were considered for this study and the reasons why they were not used are described.

#### 2.7.2.1 Skinfold measurement

Skinfold thickness measurements taken at multiple sites using skinfold calipers estimate the amount of subcutaneous fat which can be used to determine total body fat. Measurements are taken at five sites, biceps, triceps, subscapular, supra-iliac and calf. Training is required to prevent measurement error and repeat measurements are required for accuracy and reliability. Equipment is inexpensive but the method is invasive and prediction models are required to calculate total body fat. Triceps skinfold has been used

in studies together with BMI as a measure of adiposity (Gortmaker *et al*., 1999b) but may not reflect differences in fat distribution that vary by ethnic group and gender. Skinfold measurement were not used in this study due to its invasive nature and the need for repeat measurements for accuracy.

#### 2.7.2.2 Waist measurements

Waist measurements provide anthropometric quantification of fat distribution and evidence is emerging that waist circumference is associated with adverse lipid and insulin concentrations in children (Berenson *et al*., 1998, Bogalusa Heart Study). A study by McCarthy *et al.* in 2005 on children aged 11-16 years showed that waist measurements had increased at a greater rate than BMI in children over the last 10 years and the increase was larger in girls. Waist measurements were not used in the study as NICE and the DH do not currently recommend using waist circumference for diagnosing childhood obesity and at present there is no consensus on how to define childhood obesity using waist measurement, although suggested cut-off points have been set for overweight and obesity using waist circumference percentiles.

### 2.8 Statistical analysis

The information from the questionnaire was analysed using the Statistical Package for Social Sciences (SPSS 16). Data is presented as frequencies, means and standard deviations. The chi-square test was used to determine level of association between variables. When multi-way contingency tables were used these results were confirmed by log linear analysis of the data, this allows the precise loci of the interactions to be

identified. Significant results are specified as occurring within schools; I (Intervention schools) or C (Control schools), or between schools at B (Baseline survey), R (repeat survey) or F (Final survey). A non-parametric paired-sample test (Wilcoxon test) was used to assess differences between body shape dissatisfaction as this data was measured at the ordinal level (sets of ranks) in the first place. A p level $<0.05$ was considered a significant result. The BMI z score was calculated using the WHO AnthroPlus package (WHO 2009).

### 2.9 Baseline survey

The aim of the baseline survey was:

1. to collect anthropometric data (height and weight) so that body mass index (BMI) of the children could be calculated to determine prevalence of overweight and obese children in the borough,
2. to obtain information on the eating and activity patterns and perceptions of body size of the children by the completion of questionnaires.

Each school was provided with a short report summarising the main results obtained from the baseline survey.

### 2.10 Presentation of study results

Following analysis of the baseline results (presented in chapter 3) an education pack was produced for schools that was specific to Bexley and in line with the national curriculum (details provided in chapter 4). Five schools in the north of the borough received the intervention and four schools acted as controls. The effect of the health promotion

activities were then evaluated by the effect of the intervention on behaviour by collecting data on eating patterns and psychological well-being after the intervention and comparing with the control schools and baseline results. A follow up survey was also conducted one year after the intervention in all schools. Results of the surveys are presented in chapter 5.

# CHAPTER 3

# RESULTS
# OF THE
# BASELINE SURVEY

## 3.0 Results of the baseline survey

The baseline survey was undertaken in all 9 study primary schools in the spring term of 2004 with nearly 650 questionnaires completed. This baseline survey was used to determine the eating patterns, activity patterns and the influence of factors such as parental control, food preferences, body size and satisfaction and well-being of children aged between 9-11 years in 9 primary schools. The results are presented for the three sections of the questionnaire. Any significant differences observed between the schools which were later used as intervention or control schools are described in the text.

Few differences in the eating habits of children were observed according to gender and BMI classification. When significant differences were found details are provided.

### 3.1 Section 1. Eating habits

Children completed the questionnaire on their eating habits to determine what they normally ate at meals and snacks. As different foods are eaten at different times of the day the questionnaire looked at meals and specific foods eaten at these meals and was based on a chronological sequence during the day. The results are separated into meals, snacks and control (who influences what children are eating) at mealtimes. Full details of the results are provided in appendix 3.

A small minority of children, 4.8% (n =31) answered they were vegetarian and 3.0% (n =19) were following a special diet.

### 3.2 Meals

All children reported that they always ate lunch, the majority always consumed an evening meal and even though breakfast was the least popular meal, over two thirds of children always ate breakfast.

#### 3.2.1 Breakfast

Over two thirds of children ate or drank something for breakfast everyday with few children never having something to eat or drink before starting school. There was no significant difference in whether breakfast was eaten between boys and girls. However thin/healthy children (71.6%, n = 249) were significantly more likely ($p<0.036$) to eat breakfast compared with overweight/obese children (61.5%, n =107).

##### 3.2.1.1 Where children ate breakfast

The majority of children ate breakfast at home, with small numbers eating breakfast at school breakfast clubs, on the way to school or somewhere else, see Table 3.

**Table 3 Where children ate breakfast in all schools.**

| | | All schools | | | |
|---|---|---|---|---|---|
| | | **At home** | **Way to school** | **Breakfast club** | **Somewhere else** |
| | | **%** (n) | **%** (n) | **%** (n) | **%** (n) |
| Where breakfast is eaten | | | | | |
| | Always | **70.9** (432) | **3.8** (15) | **4.7** (17) | **3.0** (11) |
| | Sometimes | **27.5** (168) | **34.4** (134) | **4.7** (17) | **36.7** (133) |
| | Never | **1.6** (10) | **61.8** (241) | **90.6** (326) | **60.3** (218) |
| | Total | **100.0** (610) | **100.0** (390) | **100.0** (360) | **100.0** (362) |

A higher proportion of children in the control schools sometimes ate breakfast at home than children in the intervention schools ($p<0.027$).

##### 3.2.1.2 What children ate for breakfast

The most popular food eaten for breakfast by all the children was cereal with nearly a third of those who ate breakfast including it every day. Toast and fruit were the next most

commonly eaten foods with three quarters of children including these foods either everyday or sometimes. Chocolate and crisps were eaten by nearly half of the children either 'everyday' or 'sometimes' at breakfast, a similar proportion to those who ate yoghurt. A summary of the foods eaten for breakfast by children who reported they ate breakfast in the baseline survey are provided in Table 4.

**Table 4 Frequency of children's food choices for breakfast in all schools at baseline.**

| Rank | Food | Always<br>% (n) | Sometimes<br>% (n) | Never<br>% (n) | Total<br>n |
|---|---|---|---|---|---|
| 1 | Breakfast cereal | 31.2 (181) | 61.6 (358) | 7.2 (42) | 581 |
| 2 | Fruit | 21.9 (113) | 54.3 (280) | 23.8 (123) | 516 |
| 3 | Toast | 13.8 (77) | 77.1 (432) | 9.1 (51) | 560 |
| 4 | Chocolate | 11.8 (59) | 37.3 (186) | 50.9 (254) | 499 |
| 5 | Crisps | 9.8 (49) | 36.1 (180) | 54.1 (269) | 498 |
| 6 | Yoghurt | 9.5 (47) | 40.4 (200) | 50.1 (248) | 495 |
| 7 | Bacon | 4.1 (21) | 52.5 (266) | 43.4 (220) | 507 |
| 8 | Egg | 3.8 (19) | 52.2 (263) | 44.0 (222) | 504 |
| 9 | Cake | 1.8 (9) | 31.8 (155) | 66.3 (323) | 487 |

The only significant differences observed in what children ate for breakfast between the intervention and control schools was that children in the intervention schools were more likely to eat yoghurt ($p<0.037$) and cake ($p<0.036$).

A significant difference was seen between gender with nearly twice as many girls eating fruit at breakfast compared to boys, (30.8%, n = 40 compared to 16.2%, n =19) in the intervention schools ($p<0.027$), (26.4%, n =33 compared to 14.7%, n =21) in the control schools ($p<0.002$).

### 3.2.1.3 What children drank at breakfast

Children were asked to indicate how often they chose milk, fizzy drink or fruit juice at breakfast. Fruit juice was the most popular drink chosen by children with a third drinking it everyday and nearly 12% choosing fizzy drinks. A summary of the drinks chosen by children for breakfast in the baseline survey is provided in Table 5.

**Table 5 Frequency of children's choice of drinks for breakfast in all schools at baseline.**

| Rank | Drink | Always % (n) | Sometimes % (n) | Never % (n) | Total n |
|---|---|---|---|---|---|
| 1 | Fruit juice | 34.2 (180) | 48.0 (253) | 17.8 (94) | 527 |
| 2 | Milk | 25.4 (132) | 44.3 (230) | 30.3 (157) | 519 |
| 3 | Fizzy drink | 11.8 (59) | 38.0 (189) | 50.2 (250) | 498 |

### 3.2.2 Lunch

Children indicated whether they ate the school meal, brought in a packed lunch or went home for their lunch. A higher proportion of children brought in a packed lunch compared to those that chose the school meal, this was significantly higher in the intervention schools (67.3% compared to 56.7%, $p<0.017$). Only one child reported going home for lunch.

#### 3.2.2.1 Packed lunch

The foods most commonly included in a packed lunch were sandwiches and crisps with three quarters of children at baseline eating sandwiches and two thirds eating crisps every day. Nearly a quarter of children reported they never included fruit and two thirds of children never included salad in their packed lunches. A summary of the foods eaten in a packed lunch at the baseline survey are provided ranked in order of always being included in children's packed lunches in Table 6.

**Table 6 Frequency of food items included in children's packed lunch at baseline in all schools.**

| **Rank** | **Food** | **Always** % (n) | **Sometimes** % (n) | **Never** % (n) | **Total** n |
|---|---|---|---|---|---|
| 1 | Sandwich | 78.8 (304) | 17.1 (66) | 4.1 (16) | 386 |
| 2 | Crisps | 65.0 (249) | 30.3 (116) | 4.7 (18) | 383 |
| 3 | Fruit | 39.4 (139) | 37.1 (131) | 23.5 (83) | 353 |
| 4 | Yoghurt | 31.4 (110) | 42.0 (147) | 26.6 (93) | 350 |
| 5 | Biscuit | 28.0 (99) | 47.7 (169) | 24.3 (86) | 354 |
| 6 | Cheese | 15.0 (49) | 36.4 (119) | 48.6 (159) | 327 |
| 7 | Sausage roll | 8.3 (27) | 46.0 (150) | 45.7 (149) | 326 |
| 8 | Salad | 7.6 (24) | 27.5 (87) | 64.9 (205) | 316 |
| 9 | Crackers | 5.1 (16) | 35.8 (113) | 59.2 (187) | 316 |
| 10 | jelly | 4.1 (13) | 20.6 (65) | 75.3 (238) | 316 |

The only significant differences in the content of packed lunches between schools were that more children in the control schools included yoghurt ($p<0.035$) and more children in the intervention schools included something else ($p<0.004$) in their packed lunch.

Overall three quarters of children included fruit in their packed lunch with a third including fruit every day. Significant differences were observed in the reported intake of fruit in packed lunches between boys and girls in the intervention and control schools. In the intervention schools more boys always ate fruit (39.1%, n =34) compared to the girls (31.0%, n =26) but more boys also never ate fruit (32.2%, n =28) as part of their packed lunch compared to girls (20.2%, n =17) ($p<0.023$). In the control schools fewer boys (36.2%, n =34) ate fruit compared to girls (51.7%, n =45) and again more boys never ate fruit (27.7%, n =26) compared to girls (13.8%, n =12), ($p<0.035$).

### 3.2.2.2 School meal

A summary of the foods chosen by children for their school meal is provided with the carbohydrate choice ranked by preference in Table 7. About a quarter of children always chose either salad or vegetables but also around a third stated they would never choose these with their school meal. A fifth of children reported always eating fruit with their lunch but a similar proportion also reported never eating fruit.

**Table 7 Frequency of children's food choices for their school meal in all schools in the baseline survey.**

| Rank | Food | Always<br>% (n) | Sometimes<br>% (n) | Never<br>% (n) | Total<br>n |
|---|---|---|---|---|---|
| | Main course | 48.1 (102) | 34.4 (73) | 17.5 (37) | 212 |
| 1 | Bread | 28.3 (62) | 53.4 (117) | 18.3 (40) | 219 |
| 2 | Pasta | 14.3 (31) | 61.3 (133) | 24.4 (53) | 217 |
| 3 | Potato | 11.0 (24) | 73.1 (160) | 16.0 (35) | 219 |
| 4 | Rice | 7.4 (16) | 48.8 (105) | 43.7 (94) | 215 |
| | Salad | 26.4 (56) | 39.2 (83) | 34.4 (73) | 212 |
| | Vegetables | 25.4 (54) | 43.7 (93) | 31.0 (66) | 213 |
| | Fruit | 20.9 (45) | 59.5 (128) | 19.5 (42) | 215 |
| | Pudding | 58.0 (131) | 31.4 (71) | 10.6 (24) | 226 |

No significant differences were observed in the eating patterns of children that chose the school meal between intervention and control schools.

### 3.2.2.3 What children drank at lunchtime

Children were asked to indicate what they would normally drink with their lunch at school. Fruit juice was the most popular drink included by half of the children followed by squash and water; few children drank milk or fizzy drinks. Less than 6% reported having nothing to drink with their lunch. The results are summarized in Table 8.

**Table 8 Frequency of the type of drinks chosen by children at lunch in the baseline survey.**

| | **Milk** | **Water** | **Fruit juice** | **Squash** | **Fizzy drink** | **Nothing** |
|---|---|---|---|---|---|---|
| | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) |
| Yes | 7.3 (45) | 33.1 (203) | 50.1 (307) | 38.5 (236) | 8.2 (50) | 5.9 (36) |
| No | 92.7 (568) | 66.9 (410) | 49.9 (306) | 61.5 (377) | 91.8 (563) | 94.1 (577) |
| Total n | 613 | 613 | 613 | 613 | 613 | 613 |

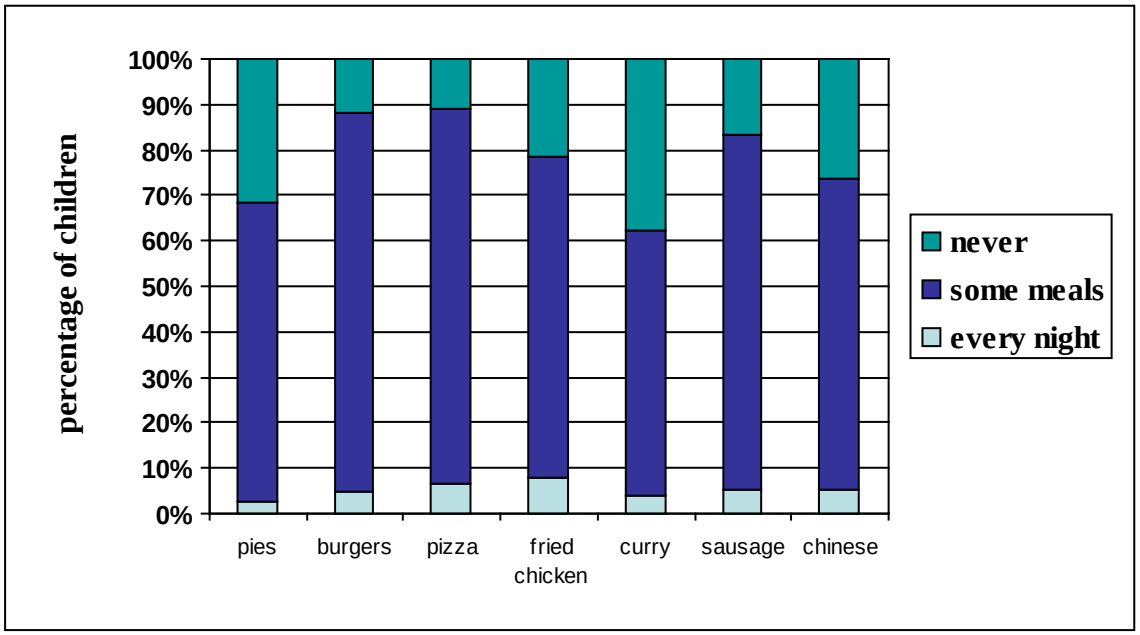
### 3.2.3 Evening meal

The majority of children (88%, n =547) indicated they ate an evening meal with fewer than 4.0% (n =23) not eating an evening meal in the baseline survey.

### 3.2.3.1 Choices for evening meal

Children were asked to indicate which foods they would normally eat as part of their evening meal from the main course options provided, mainly high fat foods which were thought to be popular with children. The majority of children reported eating them some evenings. Details are represented in Figure 11.

**Fig 11 Types of evening meals eaten by all children in the baseline survey**




Bread and chips were eaten most often by children as the carbohydrate portion of their evening meal, these being twice as popular as the other carbohydrate choices eaten every night. Very little variation was seen between the other choices apart from chapatti which was the less popular choice. A quarter of children consumed vegetables every night with their meal and fruit was eaten by a fifth. Nearly a fifth of the children reported never eating vegetables with their evening meal and over a third never eating fruit. A summary of the carbohydrate (ranked in order of whether it was eaten every night), vegetable and fruit intake for the evening meal is provided in Table 9.

**Table 9 Frequency of carbohydrate, vegetable and fruit intake of children at the evening meal in the baseline survey.**

| Rank | Food | Always<br>% (n) | Sometimes<br>% (n) | Never<br>% (n) | Total<br>n |
|---|---|---|---|---|---|
| 1 | Bread | 18.0 (101) | 57.0 (320) | 25.0 (140) | 561 |
| 2 | Chips | 17.0 (101) | 76.8 (456) | 6.2 (37) | 594 |
| 3 | Rice | 10.7 (61) | 65.2 (373) | 24.1 (138) | 572 |
| =4 | Potato | 9.1 (52) | 70.5 (404) | 20.4 (117) | 573 |
| =4 | Pasta | 9.1 (52) | 71.4 (406) | 19.5 (111) | 569 |
| 6 | Chapatti | 2.8 (15) | 29.5 (160) | 67.5 (366) | 542 |
| | Vegetables | 24.9 (146) | 56.7 (332) | 18.4 (108) | 586 |
| | Fruit | 19.5 (110) | 41.7 (235) | 38.7 (218) | 563 |

More girls ate vegetables with their evening meals compared to boys, this trend was observed in the intervention schools (29.2% n =42, compared to 18.8% n =25) and reached significant levels in the control schools (33.5% n =46, compared to 18.9% n =32) ($p<0.015$).

### 3.2.4 Snacks

Children were asked to indicate whether they ate snacks between meals and what foods and drinks they chose at mid-morning, afternoon and bedtime. The afternoon was the most popular time to eat a snack with morning break being the least popular.

A checklist of possible drinks and food items were provided for the children to indicate their normal eating habits at morning break.

Water was drunk by 45% of children during the morning break with few children stating they never drank water. About a third of children had school milk, a summary of the drinks chosen by children is provided in Table 10.

**Table 10 Frequency of children's drink choices for mid-morning snack in all schools at baseline.**

| **Rank** | **Drink** | **Always** % (n) | **Sometimes** % (n) | **Never** % (n) | Total n |
|---|---|---|---|---|---|
| 1 | Water | 45.0 (221) | 39.5 (194) | 15.5 (76) | 491 |
| 2 | Milk | 31.6 (156) | 32.2 (159) | 36.2 (179) | 494 |
| 3 | Fruit juice | 24.0 (107) | 30.5 (136) | 45.5 (203) | 446 |

Although school milk was available to all children; free to those eligible for free school dinners (14-68% of children depending on school) or for a small termly payment for others, results showed that milk was drunk by between a quarter and a third of children everyday in all schools. A difference was observed between schools ($p<0.013$) with a

higher percentage of children in the intervention schools always or sometimes drinking milk.

### 3.2.4.1 Mid-morning snacks

Fruit was the most popular food item chosen by children for morning break followed by crisps, with about twice as many children eating these foods compared to the other snack choices listed. A summary of the foods chosen for mid-morning snack is provided in Table 11.

**Table 11 Frequency of children's food choices for mid-morning snack in all schools at baseline.**

| Rank | Food | Always % (n) | Sometimes % (n) | Never % (n) | Total n |
|---|---|---|---|---|---|
| 1 | Fruit | 29.8 (138) | 45.4 (210) | 24.8 (115) | 463 |
| 2 | Crisps | 20.8 (94) | 42.0 (190) | 37.2 (168) | 452 |
| 3 | Chocolate | 12.8 (57) | 35.1 (156) | 52.1 (232) | 445 |
| 4 | Yoghurt | 11.8 (51) | 22.7 (98) | 65.4 (282) | 431 |
| 5 | Sweets | 10.6 (47) | 32.7 (145) | 56.7 (251) | 443 |
| 6 | Raisins | 6.5 (28) | 20.7 (90) | 72.8 (316) | 434 |
| 7 | Cake | 6.3 (27) | 29.9 (129) | 63.8 (275) | 431 |

Significant differences were seen with fruit and crisps intake with a higher proportion of children reported never eating fruit during the morning break in the control schools ($p<0.003$), and never eating crisps in the intervention schools ($p<0.001$). Significant differences were also observed between boys and girls in the choice of fruit as a morning snack. Fewer boys ate fruit compared to girls, 25.9% (n =30) compared to 42.2% (n =49) in the intervention schools, ($p<0.019$), and 19.5% (n =24) compared to 32.4% (n =34) in the control schools ($p<0.007$).

### 3.2.4.2 Afternoon snacks

Nearly two thirds of all children surveyed always included a snack in the afternoon with fewer than 6% never having something to eat. Fruit and crisps were the most popular choices as an afternoon snack eaten by about a third of children everyday with less than

20% stating they never ate these foods for afternoon snack. Cake and raisins were the least popular choices. A summary of the afternoon snack choices of children ranked in order of popularity are provided in Table 12.

**Table 12 Frequency of children's food choices for mid-afternoon snack in all schools at baseline.**

| Rank | Food | Always<br>% (n) | Sometimes<br>% (n) | Never<br>% (n) | Total<br>n |
|---|---|---|---|---|---|
| 1 | Fruit | 32.7 (167) | 48.7 (248) | 18.6 (95) | 510 |
| 2 | Crisps | 30.0 (155) | 52.9 (273) | 17.1 (88) | 516 |
| 3 | Sandwich | 26.3 (128) | 39.7 (193) | 34.0 (165) | 486 |
| 4 | Chocolate | 24.0 (122) | 59.7 (304) | 16.3 (83) | 509 |
| 5 | Sweets | 22.4 (110) | 54.6 (268) | 23.0 (113) | 491 |
| 6 | Yoghurt | 16.4 (77) | 45.8 (215) | 37.8 (177) | 469 |
| 7 | Cake | 11.0 (50) | 43.9 (200) | 45.1 (206) | 456 |
| 8 | Raisins | 4.6 (21) | 18.6 (84) | 76.8 (346) | 452 |

In the intervention schools a higher proportion of children ate chocolate everyday in the afternoon compared to the control schools ($p<0.048$).

### 3.2.4.3 Bedtime snacks

Around half of the children always ate a snack at bedtime. Thin/healthy children were more likely to eat a bedtime snack compared to overweight/obese children; values in the intervention schools 57.1% (n =80) compared to 38.2% (n =21), ($p<0.036$) and 50.0% (n =102) compared to 34.7% (n =41), ($p<0.018$) in the control schools.

Milky drinks and fruit were the most popular choices by children for bedtime snacks with about a quarter of children consuming these foods every night, cakes and raisins were the least popular choices with fewer than 10% eating these snacks. A summary of the frequency of snacks eaten at bedtime by children in the baseline survey ranked by popularity are provided in Table 13.

**Table 13 Frequency of children's food choices for bedtime snack in all schools at baseline.**

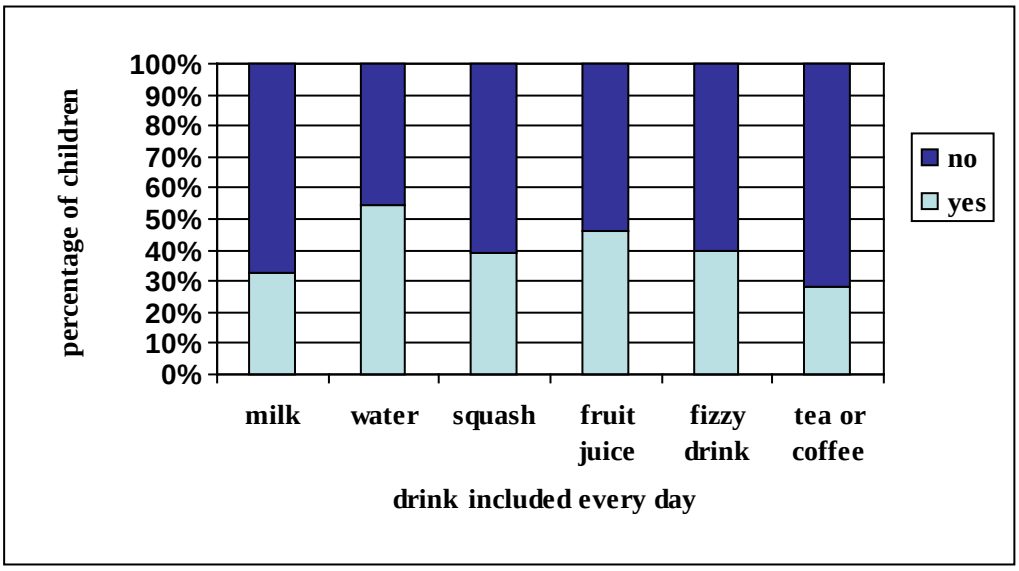
| Rank | Food | Always % (n) | Sometimes % (n) | Never % (n) | Total n |
|---|---|---|---|---|---|
| 1 | Milky drink | 27.3 (134) | 45.0 (222) | 27.7 (136) | 491 |
| 2 | Fruit | 25.5 (127) | 54.8 (273) | 19.7 (98) | 498 |
| 3 | Crisps | 16.9 (80) | 50.6 (240) | 32.5 (154) | 474 |
| 4 | Sandwich | 15.3 (70) | 41.4 (190) | 43.3 (199) | 459 |
| 5 | Chocolate | 15.0 (71) | 55.5 (263) | 29.5 (140) | 474 |
| 6 | Sweets | 11.7 (55) | 50.2 (236) | 38.1 (179) | 470 |
| 7 | Cake | 9.3 (43) | 50.9 (234) | 39.8 (183) | 460 |
| 8 | Raisins | 3.9 (17) | 15.1 (66) | 81.0 (355) | 438 |

No significant differences were observed between intervention and control schools in what was eaten at bedtime but a difference in the consumption of chocolate was seen between thin/healthy and overweight/obese children in the intervention schools, with more thin/healthy children eating chocolate than overweight/obese children (20%, n =23 compared to 4.7%, n =2 $p<0.033$).

### 3.2.5 Drinks

Children were asked to indicate which drinks they included every day from the list of options provided; they were able to choose as many options as they needed. Water and fruit juice were the most popular choices and these were drunk by around half of the children, a summary of the responses are provided in Figure 12.

**Fig 12 The proportion of children including variety of drinks every day in all schools in the baseline survey.**




### 3.2.6 Children's reported frequency of fruit intake

Children were asked to indicate how often they ate fruit with responses from every day to never. A third of children reported eating fruit every day and one in ten reported never eating fruit. No differences were observed in the responses of children in the intervention and control schools.

### 3.3 Who influenced what children were eating at mealtimes

Children were provided with a list of options to indicate who chose what was eaten at mealtimes (breakfast, packed lunch and evening meal); you (child), parent or someone else. Many children ticked more than one option at each meal and due to the small numbers for some combinations the answers were recoded into four categories; child, parent, child and parent and other. These four categories were used for any analysis of the data for each meal.

Differences according to school, gender or BMI classifications were analyzed.

This information provides useful indicators on whether children perceived they had any influence on food choice at mealtimes.

### 3.3.1 Breakfast

Two thirds of children answered that they alone chose what was eaten at breakfast. A higher percentage of parent and child together chose what was eaten at breakfast in the control schools compared to the intervention schools ($p<0.001$). No significant difference was observed in the responses of children by gender or by BMI classification.

### 3.3.2 Packed lunch

Nearly half of the children answered that their parents chose what was included in their packed lunch, 10% that they and a parent chose and 40% that they alone chose the contents of their packed lunches. No significant difference was observed in who chose the packed lunch items by schools, gender or BMI classification.

### 3.3.3 Evening meal

Between half and two thirds of the children indicated that the evening meal was chosen by their parents, with a further 10 to 20% chosen by a parent and themselves and a fifth chose their own meals. No significant differences were observed in the responses of children by schools, gender or by BMI classification.

## 3.4 Overall summary of differences observed in children's eating habits at baseline

The significant differences observed in children's eating habits between the intervention and control schools in the baseline survey are summarized together with the differences observed by gender and BMI classification in the following tables 14, 15 and 16.

**Table 14 Summary table of differences observed between intervention and control schools in children's eating habits in the baseline survey**

| Meal | Difference in eating habits | School |
|---|---|---|
| Breakfast | More children sometimes eat breakfast at home | **C** |
| | More children sometimes eat yoghurt | **I** |
| | More children sometimes eat cake | **I** |
| Lunch | More children bring a packed lunch to school | **I** |
| | More children eat yogurt as part of a packed lunch | **C** |
| | More children never eat something else in packed lunch | **C** |
| Evening meal | More children never eat pies | **C** |
| | More children always eat potato | **C** |
| | More children always eat chapatti | **I** |
| Mid morning snack | More children sometimes drink milk | **I** |
| | More children never eat fruit | **C** |
| | More children never eat crisps | **I** |
| | More children sometimes eat yoghurt | **I** |
| Mid afternoon snack | More children eat chocolate | **I** |
| | More children eat something else | **I** |
| Bedtime snack | More children never eat something else | **C** |
| Control | More child and parent choose what is eaten for breakfast | **C** |

I- Intervention schools C- control schools

**Table 15 Summary table of differences observed between BMI classification and children's eating habits in the baseline survey according to school**

| Meal or food | BMI classification | School |
|---|---|---|
| Eat breakfast | Fewer overweight/obese children eat breakfast | **All schools** |
| Bedtime snack | Fewer overweight/obese children eat bedtime snack | **All schools** |
| Bedtime - chocolate | Fewer overweight/obese children eat chocolate for bedtime snack | **I** |

I –intervention schools

**Table 16 Summary table of differences observed between gender and children's eating habits in the baseline survey**

| Meal or food | Gender | School |
|---|---|---|
| Breakfast - fruit | More girls eat fruit at breakfast | **All schools** |
| Pack lunch - fruit | More girls eat fruit with their pack lunch<br>More boys never eat fruit with their pack lunch | **All schools** |
| Evening meal -vegetables | More girls eat vegetables | **C** |
| Mid morning -fruit | More girls eat fruit mid morning | **All schools** |
| Mean daily fruit intake | Higher in girls | **All schools** |
| Mean daily crisp intake | Higher in boys | **All schools** |
| Mean daily chocolate intake | Higher in boys | **All schools** |

C- control schools

## 3.4 Section 2. Activity patterns

Children's activity patterns were determined by their responses to questions about their journey to and from school, playtime activities, involvement in PE lessons and sedentary

behaviour of television viewing and playing computer games. Any differences observed between schools or by gender and BMI classification are also noted.

### 3.4.1 Travel to and from school

Children were provided with a range of options to describe how they traveled to and from school; multiple responses were possible. Walking (69.1%-73.5%) and traveling by car (37.0%-46.1%) were the most common ways of getting to and from school. Differences were observed between schools with nearly half of the children in the intervention schools reporting traveling to school by car compared to approximately a third of children in the control schools($p<0.033$). Fewer than 4% of children cycled or used other means of transport to school and there was no difference observed between schools. No statistically significant differences were observed in the responses of boys and girls or between BMI classification to how they traveled to and from school.

### 3.4.2 Playtime activities

Children were provided with a range of options and asked to indicate their normal activity at playtime; multiple responses were possible.

'Running around' was the most popular activity with over three quarters of all children including this in their playtime activities. 'Other activities' which included any organized games, use of equipment etc. was the next most common option chosen at playtime included by up to a quarter of children and there was a significant difference between intervention and control schools ($p<0.029$) in children choosing other activities at playtime with more children in the control schools choosing this option. The percentage of children who included walking or standing as a playtime activity remained fairly constant in all schools with about a fifth walking and fewer than 6% standing.

The only significant difference observed in the responses of children within the BMI classification groups and their choice of playtime activities was that a higher percentage of obese children 32.4% (n =35) chose walking at baseline compared to 25% (n =6) thin, 17.5% (n =57) healthy weight and 14.9% (n =10) overweight children ($p<0.005$).

When playtime activities were compared by gender, significant differences were observed with some activities. A higher percentage of boys ran around ($p<0.050$) and girls were three times more likely to walk during playtime ($p<0.001$).

### 3.4.3 PE lessons

Around two thirds of children stated they enjoyed PE lessons with one third answering 'depends' and fewer than 5% not enjoying the lessons. No difference was observed in the responses of boys and girls to whether they enjoyed PE lessons.

A trend was seen between the BMI groups and enjoyment of PE lessons in all schools with a higher percentage of healthy and overweight children enjoying PE lessons compared to thin and obese children but this did not reach significant levels ($p<0.052$).

When asked to indicate which sporting activities children participated in at school, football and swimming were the most popular chosen by over 60% of children with all other activities chosen by between a quarter and a third of children. Fewer than 5% indicated that they did not participate in any activities.

No difference was observed in the responses of children within the different BMI groups to any of the sports available. When the responses of boys and girls were compared to their participation in sporting activities offered by the schools significant differences were found. More boys played basketball ($p<0.023$), rugby ($p<0.003$), cricket ($p<0.001$), rounders ($p<0.0.015$) and football ($p<0.001$) and more girls chose swimming ($p<0.001$), netball ($p<0.001$) and gymnastics ($p<0.014$).

### 3.4.4 TV viewing

Children were asked to indicate how often they watched television at home, with options from every day to never.

Nearly half of the children watched TV every day with about a quarter watching TV most days and another quarter watching TV some days, less than 1.5% of the children reported never watching TV. A trend was observed that a higher percentage of boys watched TV every day and most days compared to girls, no difference was observed in the TV viewing with the age of the children or with the BMI classification groups.

### 3.4.5 Computer games

Children were asked to indicate how often they played computer games at home with options from every day to never.

About 20% of children played computer games every day, 25% most days, 40% some days with 13% never playing computer games. A higher percentage of boys played computer games ($p<0.001$). About a third of boys played computer games every day, most days or some days with only 4% never playing computer games. In comparison less than 9% of girls played computer games every day, with nearly half playing some days and

about 20% never playing computer games. No difference in computer game playing was observed between BMI groups or with age.

The only significant differences observed according to BMI groups was seen in the higher proportion of obese children walking during playtime at schools, no difference was observed in participation in sports at school or sedentary pursuits of watching television or playing computer games.

### 3.5 Section 3. Well-being

#### 3.5.1 Body image

Boys and girls were asked to identify a body shape that they thought looked like them (perceived) and also to identify a body shape that they would like to look like (desired). The body shapes were numbered from 1 to 7, with 1 classed as emaciated to 7 classed as obese. The body shapes used in this study are shown together with the results for boys and girls.

In both boys and girls there was a significant difference in what they thought looked like them (perceived) and what they wanted to look like (desired).

### 3.5.1.1 Boys

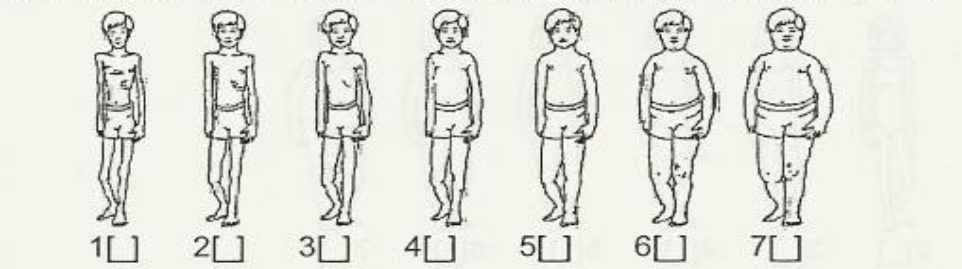



**Table 17 Body shapes selected by boys as representing how they look (perceived shape) and how they would like to look (desired shape).**

| Body shape | **1** % (n) | **2** % (n) | **3** % (n) | **4** % (n) | **5** % (n) | **6** % (n) | **7** % (n) | **Total** **%** (n) |
|---|---|---|---|---|---|---|---|---|
| Perceived | **1.2** (4) | **3.0** (10) | **22.0** (73) | **42.8**(142) | **24.4** (81) | **5.7** (19) | **0.9** (3) | **100.0**(332) |
| Desired | **3.0** (10) | **4.0** (13) | **25.2** (83) | **50.2**(165) | **16.7** (55) | **0.9** (3) | **0** (0) | **100.0**(329) |
| Mean BMI | 15.17 | 15.62 | 16.70 | 17.85 | 20.39 | 25.80 | 27.95 | |
| Std Deviation | 0.83 | 0.83 | 1.62 | 2.50 | 2.97 | 3.46 | 5.28 | |

Body shape number 4 was most frequently chosen by boys as their perceived shape and also their desired shape.

When choosing a shape to represent their perceived body shape over 40% of the boys chose body shape 4 and nearly half classified themselves as either a body shape of 3 or 5. Less than 7% of boys identified themselves with a body shape of 6 or 7 and very few (4.2%) chose body shape 1 or 2.

When choosing a shape to represent their desired shape half of the boys chose body shape 4 but a higher percentage chose body shape 3 compared to body shape 5. Less than 1% of boys chose body shape 6 or 7 and 7% chose body shape 1 or 2. Full details are provided in Table 17.

### 3.5.1.2 Girls

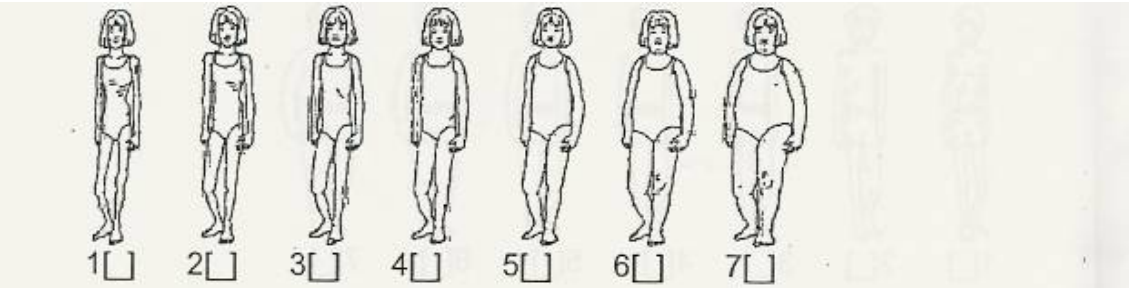



**Table 18 Body shapes selected by girls as representing how they look (perceived shape) and how they would like to look (desired shape).**

| Body shape | **1** % (n) | **2** % (n) | **3** % (n) | **4** % (n) | **5** % (n) | **6** % (n) | **7** % (n) | **Total** **%** (n) |
|---|---|---|---|---|---|---|---|---|
| Perceived | **1.3** (4) | **3.0** (9) | **14.1** (43) | **45.9**(140) | **26.2** (80) | **7.5** (23) | **2.0** (6) | **100.0**(305) |
| Desired | **2.6** (8) | **7.6** (23) | **19.8** (60) | **57.1**(173) | **11.9** (36) | **0.7** (2) | **0.3** (1) | **100.0**(303) |
| Mean BMI | 17.39 | 16.36 | 16.19 | 17.92 | 21.00 | 26.17 | 26.12 | |
| Std Deviation | 2.54 | 2.31 | 1.68 | 2.17 | 3.156 | 2.46 | 4.27 | |

Body shape number 4 was most frequently chosen by girls as their perceived shape and also their desired shape.

When choosing a body shape that represented their perceived shape nearly half of the girls chose body shape 4, a quarter selected body shape 5 compared to 14.1% selecting body shape 3. Fewer than 10% of girls identified themselves with a body shape of 6 or 7 and one girl described herself as an 8. Few girls (less than 4.5%) selected body shape 1 or 2.

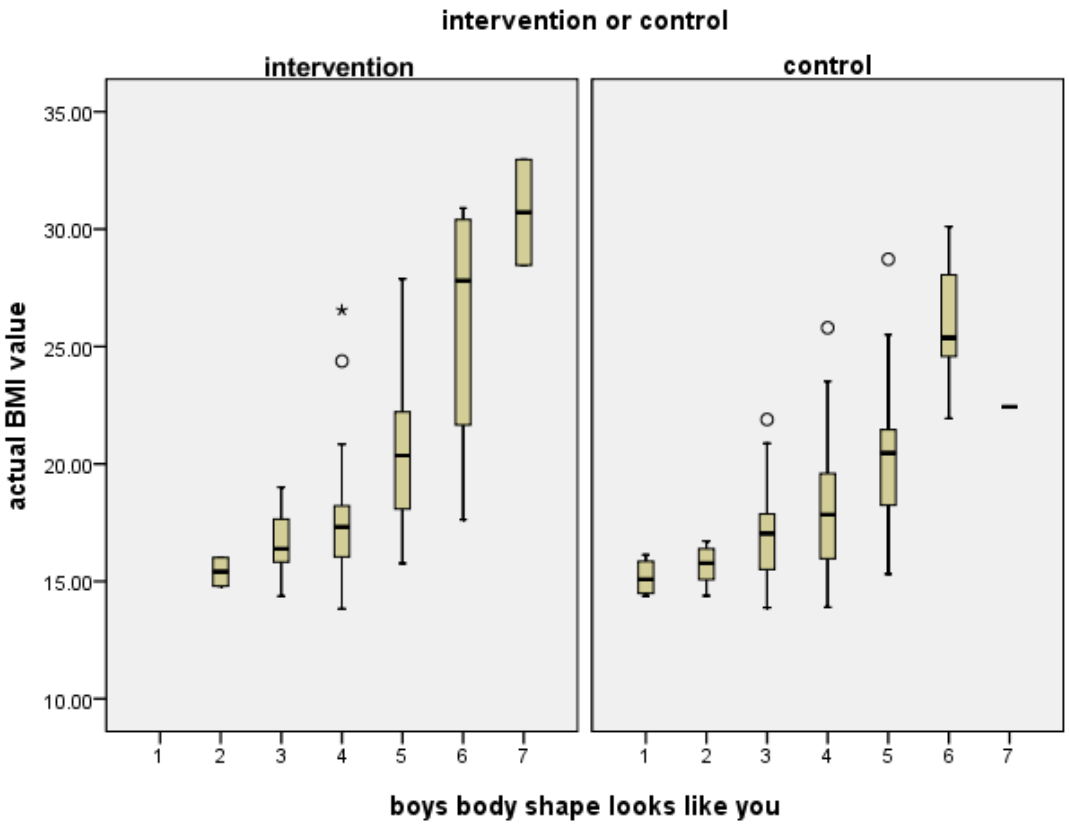
When choosing a shape to represent their desired shape over half of the girls chose body shape 4 and a higher percentage of girls selected body shape 3 compared to body shape 5. Around 10% of girls selected body shape 1 or 2 but only 1% of girls selected a body shape of 6 or 7. These differences are shown in Table 18.

### 3.5.2 Body shape selection and actual BMI

To determine if the body shape selected by the children was a true representation of their actual body shape the body shape selected was plotted against children's actual BMI. In boys actual mean BMI increased as perceived body shape increased from 1 (BMI 15.17) to 7 (BMI 27.95). Mean BMI in girls increased as perceived body shape increased from 3 (BMI 16.19) to 6 (BMI 26.17), with mean BMI decreasing for shapes 1 and 2 higher than body shape 3. Boys appeared to more accurately select a shape that represented their body size whereas in girls this was only apparent from body shape 3 to 7.

Box plots of BMI compared to perceived body shape are shown for both boys and girls, Figures 13 and 14. The box represents the portion of BMI falling between the $25^{th}$ and $75^{th}$ percentiles with the median represented by the thick horizontal line in the box. The vertical lines above and below show the largest and smaller values that are not outliers. Any extreme scores are indicated as o or * with the child's identification number.

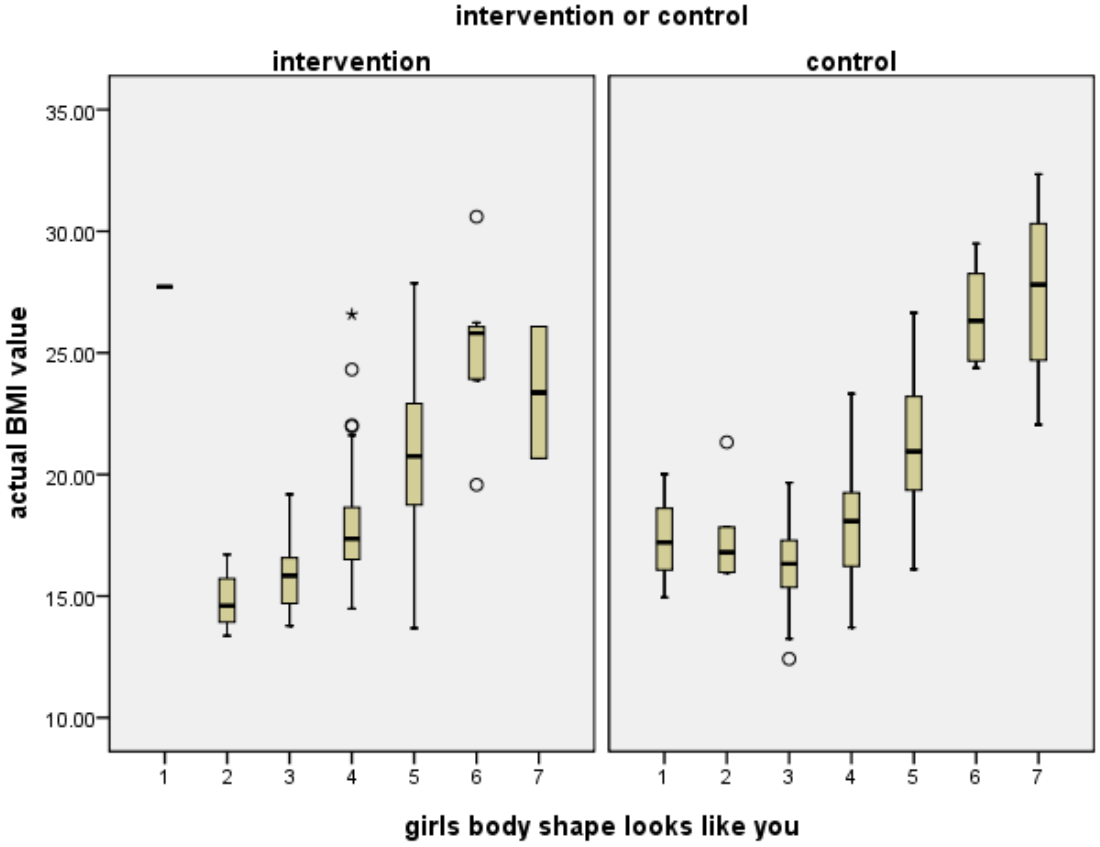
**Fig 13 Box plot of actual BMI of boys compared to perceived body shape in intervention and control schools at the baseline survey.**




number 1-7 indicate body shape (from 1 = emaciated to 7 = obese)

In both intervention and control schools BMI increases with an increase in perceived body shape in boys

**Fig 14 Box plot of actual BMI of girls compared to perceived body shape in intervention and control schools at the baseline survey.**




number 1-7 indicate body shape (from 1 = emaciated to 7 = obese)

In both intervention and control schools BMI increases with an increase in perceived body shape from body shape 3 to 6 in girls. Few girls perceived themselves to be a body shape of 1 and 2 and these girls had a BMI similar to body shape between 3 and 4, one girl was omitted from the results as she had a perceived body shape of 1 and a BMI of 27.7.

Both boys and girls had a higher mean value in their perceived shape compared to their desired shape, with a greater difference observed in the girls (Table 19).

**Table 19 A comparison of mean values of body shapes selected by boys and girls as their perceived and desired body shape.**

| | Boys | | | Girls | | |
|---|---|---|---|---|---|---|
| | Mean | N | Std deviation | Mean | N | Std deviation |
| Perceived | 4.07 | 327 | 1.01 | 4.24 | 302 | 1.03 |
| Desired | 3.76 | 317 | 0.91 | 3.71 | 302 | 0.92 |

To determine if there were significant differences between children's perceived and desired ideal shape, the Wilcoxon signed ranks test was applied. This showed a significant difference for both boys and girls with a discrepancy between perceived and desired shape.

There was a tendency for both boys and girls to perceive themselves as heavier than their desired ideal with a greater discrepancy observed in children in the intervention schools compared to the control schools, details are provided below and in Table 20. Girls were seen to have a greater discrepancy and perceived themselves to have a heavier body shape than indicated by their BMI.

All children:

Baseline: Intervention school **Z=-7.664** ($p<0.001$) Control school **Z=-5.883** ($p<0.001$)

**Table 20 Discrepancy between perceived and desired body shape of boys and girls as determined by the Wilcoxon signed ranks test.**

| | survey | Intervention schools | Control schools |
|---|---|---|---|
| Boys | B | -5.095 ($p<0.001$) | -2.990 ($p<0.003$) |
| Girls | B | -5.822 ($p<0.001$) | -5.365 ($p<0.001$) |

### 3.5.3 Body image dissatisfaction

The discrepancy between the perceived shape and the desired shape was used to determine any body image dissatisfaction. This was obtained by subtracting the score of the figure selected by children as their desired shape from their actual perceived score. A positive score indicating that children wished to be thinner, a negative score indicating that they wished to be heavier and a score of 0 indicating no discrepancy.

When body shape satisfaction scores were compared over half of the boys had a score of 0 indicating their perceived body shape matched their desired shape. About a third had a positive score indicating they wanted to be thinner with the majority having a score of 1 or 2 indicating they wanted to be thinner by 1 or 2 body shapes. Fewer than 13% had a negative score indicating they wanted to be heavier with the majority having a score of -1 indicating they wanted to be heavier by 1 body shape.

In girls just under a half had a score of 0 indicating no discrepancy between perceived and desired shape. Around 45% had a positive score indicating they wanted to be thinner; of these nearly a third had a score of 1 and around 10% a score of 2. Fewer than 12% had a negative score indicating they wanted to be heavier with the majority having a score of -1 indicating they wanted to be heavier by 1 body shape.

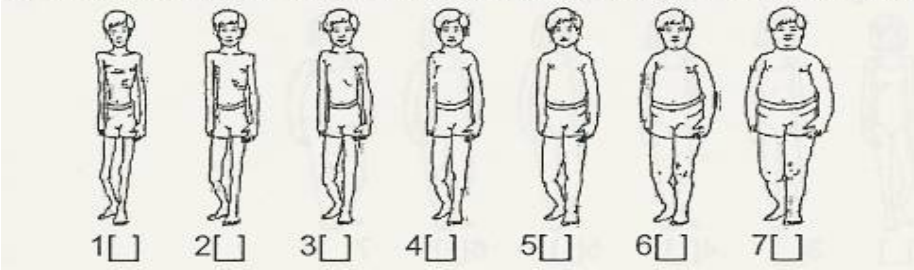
Body shape dissatisfaction scores ranged from -6 to +5, full details are provided in Table 21. Results are provided for all schools, no difference was observed between the intervention and control schools.

**Table 21 A comparison of body shape dissatisfaction score of boys and girls.**

| Body shape satisfaction score | | **Boys** | **Girls** |
|---|---|---|---|
| | Score | % (n) | % (n) |
| | -6 | | **0.3** (1) |
| | -5 | | |
| - score = desire to be heavier | -4 | | **0.3** (1) |
| | -3 | **0.3** (1) | |
| | -2 | **0.9** (3) | **0.7** (20 |
| | -1 | **11.3** (37) | **8.3** (25) |
| 0 = no discrepancy | 0 | **57.2** (187) | **47.0** (142) |
| | +1 | **19.0** (62) | **29.8** (90) |
| | +2 | **9.2** (30) | **8.3** (25) |
| + score = desire to be thinner | +3 | **1.5** (5) | **3.0** (9) |
| | +4 | **0.6** (2) | **1.3** (4) |
| | +5 | | **1.0** (3) |
| Total | | **100.0** (327) | **100.0** (302) |

The body shape dissatisfaction score was calculated for each body shape selected by boys and girls as their perceived shape. This showed that the percentage with no discrepancy between perceived and desired shape (score of 0) differed with body shape and details are provided in Tables 22 and 23.

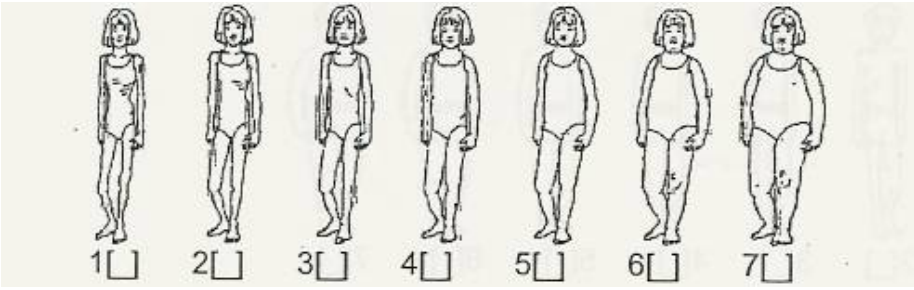
**Table 22 Body shape dissatisfaction score of boys for each body shape chosen as their perceived shape**




| | **Shape 1** | **Shape 2** | **Shape 3** | **Shape 4** | **Shape 5** | **Shape 6** | **Shape 7** |
|---|---|---|---|---|---|---|---|
| score | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) |
| -6 | | | | | | | |
| -5 | | | | | | | |
| -4 | | | | | | | |
| -3 | **25.0**(1) | | | | | | |
| -2 | | **10.0**(1) | **2.8**(2) | | | | |
| -1 | **25.0**(1) | **20.0**(2) | **18.1**(13) | **14.4**(20) | **1.2**(1) | | |
| 0 | **50.0**(2) | **50.0**(5) | **70.8**(51) | **72.7**(101) | **32.5**(26) | **10.5**(2) | |
| 1 | | **20.0**(2) | **2.8** (20) | **9.4** (13) | **47.5**(38) | **36.8**(7) | |
| 2 | | | **5.6** (4) | **2.9** (4) | **16.2**(13) | **47.4**(9) | |
| 3 | | | | **0.7** (1) | **1.2** (1) | **5.3** (1) | **66.7**(2) |
| 4 | | | | | **1.2** (1) | | **33.1**(1) |
| Total no | 4 | 10 | 72 | 139 | 80 | 19 | 3 |

In boys who perceived themselves as body shape 1 to 4 a half to nearly three quarters had zero scores indicating no discrepancy whereas only a third of boys with body shape 5 and 10% with body shape 6 had a zero score.

**Table 23 Body shape dissatisfaction score of girls for each body shape chosen as their perceived shape**




| | **Shape 1** | **Shape 2** | **Shape 3** | **Shape 4** | **Shape 5** | **Shape 6** | **Shape 7** |
|---|---|---|---|---|---|---|---|
| score | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) |
| -6 | **25.0**(1) | | | | | | |
| -5 | | | | | | | |
| -4 | **25.0**(1) | | | | | | |
| -3 | | | | | | | |
| -2 | | **12.5**(1) | **2.3**(1) | | | | |
| -1 | | | **34.9**(15) | **7.2**(10) | | | |
| 0 | **50.0**(2) | **75.0**(6) | **44.2**(19) | **69.8**(97) | **20.3**(16) | **8.7**(2) | |
| 1 | | **12.5**(1) | **18.6** (8) | **18.7**(26) | **60.8**(48) | **30.4**(7) | |
| 2 | | | | **2.9** (4) | **13.9**(11) | **39.1**(9) | **16.7**(1) |
| 3 | | | | **1.4** (2) | **3.8** (3) | **8.7** (2) | **33.3**(2) |
| 4 | | | | | **1.3** (1) | **4.3** (1) | **33.3**(2) |
| 5 | | | | | | **8.7** (2) | **16.7**(1) |
| Total no | 4 | 8 | 43 | 139 | 79 | 23 | 6 |

In girls between half and three quarters of those who perceived themselves as body shape 1-4 had zero scores, whereas only a fifth of body shape 5 and 10% of body shape 6 had zero scores with the rest having a negative score indicating they wanted to be thinner, with the dissatisfaction score increasing with body shape number.

### 3.5.3.1 Body shape dissatisfaction score and BMI groups

Due to the small numbers for scores at the extreme end of the scale the body shape dissatisfaction scores were recoded into four categories;

- -1 (to include all negative scores)
- 0 (no discrepancy)

- 1 (positive score of 1)
- 2 (to include all positive scores 2 or above)

This recoded body shape dissatisfaction score was then compared with BMI groups (thin, healthy, overweight and obese) for boys and girls to see if there was any difference between gender and between BMI groups (Table 24).

**Table 24 A comparison of recoded body shape dissatisfaction score of boys and girls according to BMI group at the baseline survey.**

| | **Boys** | | | | **Girls** | | | |
|---|---|---|---|---|---|---|---|---|
| | Desire to be heavier | No discrepancy | Desire to be thinner | | Desire to be heavier | No discrepancy | Desire to be thinner | |
| BMI group | **-1** | **0** | **1** | **-1** | **-1** | **0** | **1** | **2** |
| | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) |
| Thin | **46.2** (6) | **53.8** (7) | **0** | **27.3** (3) | **27.3** (3) | **63.6** (7) | **9.1** (1) | **0** |
| Healthy | **19.8** (32) | **66.0** (107) | **9.3** (15) | **12.3** (20) | **12.3** (20) | **57.1** (93) | **27.5** (45) | **3.1** (5) |
| Overweight | **2.6** (1) | **59.0** (23) | **28.2** (11) | **6.7** (2) | **6.7** (2) | **36.6** (11) | **50.0** (15) | **6.7** (2) |
| Obese | **0** | **30.4** (17) | **44.6** (25) | **3.8** (2) | **3.8** (2) | **15.1** (8) | **32.1** (17) | **49.0** (26) |

Half of thin boys had a 0 score indicating no discrepancy between perceived and desired shape and the remainder wanted to be heavier. This group consisted of very small numbers of boys.

In the healthy BMI group two thirds of boys had a 0 score indicating no discrepancy between perceived and desired shape. A similar percentage of the remaining boys wanted to be heavier or thinner.

Just over half the overweight boys had a 0 score with the majority of the remaining boys wanting to be thinner with up to 10% of these having a score of 2. Fewer than 3% of the overweight boys wanted to be heavier.

The obese boys had the lowest percentage of 0 scores with less than a third indicating they had no discrepancy with body shape with all the other boys in this group wanting to be thinner with about a quarter of these having a score of 2.

In summary, few boys were classified as thin and over half had no discrepancy between perceived and desired shape. For the other boys the percentage whose perceived and desired shapes matched (0 score) decreased in the following order, healthy, overweight and obese categories. Conversely the percentage who desired to be thinner and the degree of thinness decreased in the following order, obese, overweight and healthy.

For the girls in the thin group just under two thirds had a 0 score with a quarter to a third wanting to be heavier and around 10% wanting to be thinner. This group had the highest 0 score in the baseline survey but consisted of very small number of girls.

Over half of girls in the healthy group had a 0 score indicating no discrepancy between perceived and desired shape, with up to 12.3% wanting to be heavier and nearly a third wanting to be thinner.

A third of overweight girls had a 0 score and the majority of the remainder wanted to be thinner with half having a score of 1.

The obese girls had the lowest percentage of 0 scores (15.1%) with over 80% wanting to be thinner and about half of these having a score of 2 indicating they wanted to be 2 or more shapes below their perceived shape.

In summary, the percentage of girls whose perceived body shape matched their desired shape (0 score) decreased in the following order thin, healthy, overweight and obese categories. Approximately half of the obese girls had a score of 2 or above indicating they wished to be thinner by 2 or more shapes below their perceived shape.

Overall girls were less satisfied with their body shape and had a lower percentage of 0 scores (no discrepancy between perceived and desired shape) in all BMI groups (apart from the thin girls) compared to boys. Also a higher percentage of girls wanted to be thinner in all BMI groups compared to boys.

### 3.5.4 Psychological well-being

Three questions were asked to indicate how children felt about themselves, two questions related to whether children worried about being bullied and one question using a pictorial scale related to general well-being.

Children were asked to choose how they felt about other children making fun of them and being called names from three responses ranging from hardly ever worries me to worries me a lot.

### 3.5.4.1 Other children making fun of me

Just over half of the children responded that being made fun of hardly ever worried them, a third worried a little and the remainder (under 15%) worried a lot. No difference was observed between the intervention or control schools or in the responses of children between the BMI groups to whether they worried about children making fun of them but a significant difference was observed between genders. Girls were significantly more likely to be worried about being made fun of ($p<0.001$).

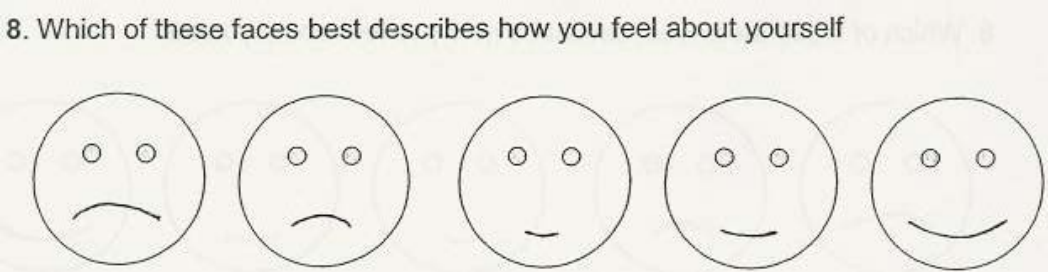
### 3.5.4.2 Called names

Around half of the children responded that being called names hardly ever worried them, a third worried a little and 15% worried a lot. No difference was observed between the intervention and control schools or in the responses of children between the BMI groups to being called names but a significant difference was observed between gender ($p<0.005$). A higher percentage of girls were worried about being called names and this was observed in intervention and control schools.

### 3.5.4.3 How you feel about yourself

A pictorial scale was used to determine general well-being as shown in Figure 15.

**Fig15 Pictorial scale used in study to determine how children felt about themselves.**



Children were asked to choose the face that described how they felt about themselves, with the stylized faces used to represent feelings from very unhappy to very happy. Around half of the children chose the very happy face to describe themselves, a quarter the happy face, 17% the OK face and under 5% choosing the unhappy and very unhappy face. No difference was observed between the intervention and control schools A significant difference was observed in the responses of boys and girls to how they described themselves ($P<0.001$). A smaller percentage of girls chose the very happy face compared to the boys and a greater percentage of girls chose the very unhappy and unhappy face.

To compare the responses of children between the different BMI groups it was necessary to recode the how you feel about yourself variable from the five responses to three due to the small numbers obtained for some responses. The new variable used was very unhappy/ unhappy, OK and happy/ very happy.

A significant difference was observed in the responses of the children between the different BMI groups ($p<0.001$). Over 80% of thin/healthy group of children described themselves as happy/very happy compared to around two thirds of the overweight/obese group of children and over twice as many of the overweight/obese groups chose the unhappy faces compared to the thin/healthy group.

## 3.6 Discussion

The questionnaire used was specifically designed for this study to obtain information on the eating and activity patterns of children aged 9-11 years. Children were able to complete the questionnaire within 20-30 minutes and only a few of the less-able children needed help from the teacher to answer some of the questions.

### 3.6.1 Eating habits

When reporting the results of the current study the reliability and validity of the questionnaire used is judged by comparing the results of the baseline survey with the results obtained from previous studies with children of a similar age group. Most food intake questionnaires previously used with children have been developed for children over 11 years of age (Johnson *et al.,* 2001). Few questionnaires aimed at this specific age group in the UK are available for comparison; two examples of FIQ include one produced by Hackett *et al*. (2002) and an adapted version of the Health Behaviour in School Children (HBSC) questionnaire used by van Sluijs *et al*. (2008). These questionnaires do not indicate when and specify how often the listed foods were eaten; the current study was interested in this aspect of children's eating patterns which is why a study-specific questionnaire was designed. Two studies that look at eating patterns for specific foods include Edmunds and Ziebland, (2002) who developed a day-in-the-life questionnaire aimed at 7-9 year old children to assess the consumption of fruit and vegetables which was based on a chronological sequence during the day. Also Moore *et al*. (2005) developed a computerized 24-hour recall measure designed to assess fruit and snack consumption of 9-11 year olds for six time-periods in the day. An example of a survey that reports the type

of foods eaten at mealtimes in the UK is the schools health education unit (SHEU, 2007) survey which is used by some primary and secondary schools to monitor the health and well being of their pupils. Any comparisons in the current study with SHEU are based on their report of 2007 for year 6 pupils. When discussing the results it is also necessary to consider that some studies have reported overestimation of consumption for most items (Vereecken *et al*., 2008) or with some food items (Vereecken and Maes, 2003) with a food frequency questionnaire used with 11-13 year olds.

#### 3.6.1.1 Meals

The majority of children (67%) had something to eat or drink for breakfast which was lower than findings of a previous study which reported that around 90% of children aged 9-10 ate a breakfast, decreasing to 68-82% in 11-12 year olds (Hackett *et al.,* 2002). Children in this study were from the most deprived areas of the borough and this may be a reason why fewer children ate breakfast. A previous study found that breakfast consumption in children varied between socioeconomic groups with fewer children from manual households eating breakfast every day compared to non-manual households (Health Promotion Agency (HPA), 2001). Most children reported they ate breakfast at home but over a third stated they would sometimes eat breakfast somewhere else or on the way to school which is similar to findings from SHEU and Hackett *et al.* 2002.

The eating patterns of children for breakfast in this study (Table ) were comparable with SHEU, apart from fruit intake was much higher in this study (22%) compared to 4%. It is noteworthy that in the baseline survey a similar proportion of children ate crisps (10%) and chocolate (12%) for breakfast to those that ate yoghurt (10%) and 12% of the children

also reported consuming fizzy drinks for breakfast. This contrasts to the lower occurrence of crisps (5.6%) for breakfast reported by Moore *et al*. (2007) in their survey of 9-11 year olds.

Packed lunches were the most popular choice for lunch with nearly two thirds opting for this as opposed to the school meal with only one child going home for lunch. The proportion of children choosing the school meal in this study was lower than that reported by the school food trust for outer London for 2005-06 (38.1% compared to 42.6%) (Nelson and Nicholas, 2006). This was also lower than expected considering that most schools had a high number of children eligible for free school meals (range 14-68%). Packed lunches have become increasingly more popular with children over recent years, in 2000 on average 45% of school pupils took a packed lunch to school (Gregory *et al.*, 2000), this had increased to about 50% in 2006. Mintel (2004) reported that 5.5 billion packed lunches were made for children each year in the UK.

The contents of the packed lunches in the current study (Table ) were consistent with studies commissioned by the Food Standards Agency: the School lunchbox survey (Jefferson and Cowbrough, 2004) and the baseline survey of the 'Smart' lunchbox (Evans and Cade, 2007) apart from a lower proportion that included fruit (40%) compared to 52-55% in the previous studies. The proportion of packed lunches that contained fruit was similar to the findings of a survey by the School Food Trust (2007) and a survey of foods eaten in schools as part of the Avon Longitudinal Study of Parents and Children (ALSPAC) by Rogers *et al.* 2007. Fewer children also had biscuits included in their packed lunches (28%) compared to 43%-68% found in all other studies.

Few children chose vegetables (25%) as part of their school meal in the current survey which is considerably lower than the 72% reported by the School Food Trust in 2008 and 81% by Rees *et al.* in 2008. Even when salad is included, the proportion that included vegetables increased to only about 50%, comparable to the results of Rogers *et al.* 2007. Of interest is that a third of children reported that they would never eat vegetables or salad with their school meal. The proportion of children who chose fruit however was similar to the previous studies at 21% (Rees *et al*. 2008, School Food Trust 2008) and higher than the study by Rogers *et al.* (2007) where less than 8% of 7 year olds ate fruit as part of the school meal.

Only 4% of children reported they did not eat an evening meal, which was similar to findings of Savige *et al*. (2007) with 12-13 year olds. A quarter of the children always ate vegetables with their evening meal and a fifth reported to never eating vegetables. The intake of vegetables at lunch and evening meal are comparable to previous surveys which reported daily vegetable intake at 30% (Vereeckan *et al.*, 2005) and 50% (van Sluijs *et al*., 2008)

#### 3.6.1.2 Snacks

Snacking in the afternoon after school was the most common time to eat snacks with two thirds of the children reporting that they always ate snacks at this time, half of the children ate a bedtime snack and mid-morning was the least popular time with just under a third eating a snack. These findings are similar to the results in a review by Nicklas *et al*. (2001) on the eating patterns of children and adolescents and Cross *et al*. (1994) who also

reported that afternoon was the most common time for snacking and morning the least common time.

Determining what children eat for snacks is important as snacking is often associated with undesirable eating habits with children choosing salty, crunchy foods with taste outranking nutrition (Cross *et al.,* 1994). In adolescents snacks have been reported to contribute 35% of total discretionary calorie intake and 43% of total added sugar intake (Sebastian *et al.,* 2008).The NDNS indicated that children in the UK had a high consumption of confectionery and savoury snacks and a study by Hackett *et al.,* (2002) found that the most common foods children claimed that they were eating were fruit, biscuits, chocolate, crisps and sweets. These items were also among the most common snacks chosen by children in the current study for mid-morning, afternoon and bedtime snacks, (Tables , , and ) their popularity varying depending on the time of day, with fruit and crisps being popular choices for all three occasions.

#### 3.6.1.3 Fruit and vegetable intake

Results for this study indicated that just over a third of children ate fruit every day in the baseline study with a further third eating fruit most days, with less than 3% reporting they never ate fruit. The proportion that ate fruit every day was lower than that reported by other UK studies with children of this age group who found that this ranged from 56 to 77% (Hackett *et al.,* 2002, Inchley *et al*., 2001, van Sluijs *et al*., 2008). The results of this study were also lower than national data which reported that the proportion of children aged 5 to 15 years who ate fresh fruit was between 56-62% (DH, 2003b). Mean daily fruit and vegetable intake (which included fruit juice counted once and dried fruit) was

calculated to be 2.06 portions for children eating a packed lunch and 2.19 portions for children eating a school meal. This is lower than the 2.4 to 2.7 portions of fruit and vegetables consumed by children between 2001 and 2004 (HSCIC, 2006). The proportion of children who hardly ever or never ate fruit was similar to that reported by The HPA, (2001).

The reliability of the questionnaire developed to assess eating habits of children for this study was confirmed by comparison with other studies conducted with children of a similar age group as described in sections 3. , 3.  and 3.  . However a few differences were found between the current survey and the other studies, notably that fewer children ate breakfast, a lower mean daily intake of fruit and vegetables, a lower consumption of vegetables with the school meal and a lower proportion of children who appeared to eat fruit every day.

### 3.6.2 Intervention design

The results of the baseline data were used to develop the nutrition content of the intervention. These indicated that the intervention should focus on breakfast and improving fruit and vegetable intake of children in Bexley. In common with other surveys of children of this age group Bexley children consumed high fat and high sugar foods as snacks and as part of their packed lunch and these topics were also included. Perceptions of accessibility to food is known to be a potential barrier to dietary changes and increasing the fruit and vegetables content of the school meals was investigated together with the provision of a fruit tuck shop in the schools.

### 3.6.3 Activity patterns, body shape and wellbeing

#### 3.6.3.1 Activity patterns

The proportion of children who walked to school (69.1%) was considerably higher than the 49% reported by the National Transport Survey (Department for Transport, 2006), whereas the values for those driven to school were very similar. The playtime activities reported were similar to a study by Warren *et al.* (2003) with 'running around' being the most popular activity with over three quarters of children including this activity. Around two thirds of children stated they enjoyed PE, which was comparable to the SHEU (2007) survey.

These results suggested that the activity patterns of children in Bexley were better or comparable to other studies and that the focus of the intervention should not be on increasing activity.

The questions on TV viewing and computer games were intended to give an approximate gauge on the frequency of these activities to determine the level of sedentary behaviour of children. Also to explore if there were any gender differences in television viewing and playing computer games. Nearly half of the children reported watching television everyday with a trend for a higher proportion of boys. Fewer children reported playing computer games everyday but it was still a popular pastime with half of the children playing computer games most days. A marked difference was found between the responses of boys and girls with boys being significantly more likely to play computer games. Peter *et al.* (2007) also reported that boys spent more time watching television and playing computer games than girls. These results reflect the general consensus that

television and playing computer games has increased the sedentary behaviour of children and this has been associated with the rising prevalence of overweight in children (Speiser *et al.,* 2005). This association was not reflected in this study as no differences were observed in the time spent watching TV or playing computer games between the BMI classification groups. Television viewing has been thought to influence children's eating habits in particular the consumption of sweets and soft drinks (Vereecken *et al.,* 2006). This association has been found to be more likely in boys and children from a lower socioeconomic status.

Encouraging children to be more active was included in the intervention as gender differences were seen in the type of playtime activities chosen at school and also because of the reported sedentary behaviour at home. Sessions focused on being active at playtime/ with their friends and on their own/at home to encourage less sedentary behaviour. Schools were also encouraged to provide playground equipment to encourage participation during playtimes. School physical-activity-related policies have shown to be positively correlated to children's physical activity (Ferreira *et al.,* 2006).

The ability to take part in sports/games and other activities is usually seen to be important for children of this age and consequently children for whom overweight or obesity is a barrier to participation, may experience isolation and low self-esteem. Whether this is based on objective reality, or a perception of overweight, body image perception and body satisfaction may also be important and linked to overall happiness. A section on body shape was included in the intervention to determine the level of body shape dissatisfaction

and if any gender differences were apparent. Any obesity prevention programme should do no harm (Livingstone *et al.,* 2006) and to confirm that this study did not unintentionally stigmatise obese children or promote negative behaviours a section on well-being and bullying was also included.

### 3.6.3.2 Assessment of body satisfaction

Body shape dissatisfaction has been reported among obese adolescents and young children (Wardle and Cooke 2005). In this current study body shape satisfaction of children was determined by asking children to select a body shape that represented how they looked (perceived shape) and also what they would like to look like (desired shape) by use of a body silhouette chart. Any discrepancy between perceived and desired shape was used to determine the degree of body shape dissatisfaction.

The most popular body shape chosen in this study by both boys and girls as their perceived body shape was silhouette 4 (middle shape from scale), this differs from the study by Gualdi-Russo *et al.* (2008) which found that boys were more likely to select body shape 5 as their perceived shape. Overall both boys and girls showed a desire to be thinner with the mean score for perceived shape being higher in both boys and girls than their desired shape, the values similar to other recent studies with children of this age group (Gualdi-Russo *et al.* 2008, Skemp-Arlt *et al*. 2006). Whereas earlier studies showed a similar trend for girls they reported that boys of this age had a desire to be heavier with higher mean scores for their desired shape than their perceived shape (Parkinson *et al*. 1998).

Actual mean BMI increased as perceived body shape increased in boys but was only apparent from body shape 4 for girls indicating that boys were more accurately estimating their body shapes at the lower end of the scale. The proportion of boys and girls in this study that chose a body shape representing thinness was similar to the actual proportion of children that were classified as underweight but the proportion that chose shapes representing overweight and obese was much lower than the actual proportion of children classed as obese. The tendency for overweight and obese children to underestimate their weight has previously been reported in children (Gualdi-Russo *et al.,* 2008) and in adolescents (Al-Sendi *et al.,* 2004). A greater discrepancy between perceived and desired shape was observed in children in the intervention schools. This could not be explained in terms of differences in the ages of the children or socio economic status as both types of schools were comparable, but there were significantly higher proportion of Black pupils in the intervention schools in the baseline survey.

Body image dissatisfaction was apparent in both boys and girls, with 42.8% of boys and 53% of girls indicating they were dissatisfied with their body image with a higher proportion of girls wanting to be thinner than their perceived shape compared to boys. These results are comparable to other studies which show body image dissatisfaction in young children (Hill *et al.,* 1994, Gualdi-Russo *et al*., 2008, Franklin *et al*., 2006, Truby and Paxton 2008). Gender differences in body satisfaction have been reported to occur at around 8-10 years of age (Ricciardelli and McCabe, 2001). In this study a similar proportion of boys and girls (between 9.6% and 12.5%) desired to be heavier than their perceived body shape. The majority of previous studies have found a higher proportion of boys desire to be heavier compared to girls (Parkinson *et al.,* 1998, Hill *et al*., 1994,

Franklin *et al*., 2006), but Skemp-Arlt *et al.* (2006) reported that the difference between boys and girls varied with the age of the children.

The level of body image dissatisfaction was dependant on the perceived body shape chosen by the children, with boys with perceived body shape 3 or 4 having the highest level of body satisfaction. Girls were more likely to be dissatisfied with their body shape for all body shapes chosen. Obese children had the highest level of body dissatisfaction with this more apparent in girls where only 15.1% reporting they were satisfied with their body shape. Obese children also had the largest discrepancy between their perceived and desired shapes again being greater in girls. These findings reflect previous studies (Gualdi-Russo *et al*., 2008, Franklin *et al.,* 2006, Hill *et al*., 1994) and emphasize the need that the intervention programme should focus on messages on healthy eating and being more active for all children and not putting children under further negative pressure about their weight.

The two major ethnic groups represented in this study were children from a White or Black background. There appears to be conflicting evidence in relation to body dissatisfaction and ethnic differences and whether this would have an impact on the results of this study as Black children had the highest proportion in the overweight/obese categories. Similar body image dissatisfaction has been reported for both white and black children (Thompson *et al.,* 1997) and body dissatisfaction as highly prevalent across ethnicity and socioeconomic status (Robinson *et al.,* 2001), whereas another review cites that black girls with high BMI's are less likely to consider themselves overweight or desire to be thin (Sweeting, 2008).

### 3.6.3.3 Psychological well-being

Several studies have reported psychological problems in overweight and obese children, ranging from lower self-esteem (Strauss, 2000), psychological distress (Allen *et al.,* 2006) to bullying (Janssen *et al*., 2004) whereas other studies have not found a clear pattern among young children (Phillips and Hill 1998).

Results of this study found that around a half of all children worried about being 'called names' or 'children making fun' of them which reflects the bullying victimisation found in school settings (Wolke *et al*., 2000). This did not differ according to BMI classification which is unlike previous studies that reported that obese children are more likely to be victims of bullying (Griffiths *et al.,* 2006, Janssen *et al*., 2004). Girls in this current study were more likely to be worried about verbal bullying than boys which is similar to a previous study. This is probably due to the fact that they are more likely to be victims of overt bullying than boys (Griffiths *et al.,* 2006).

Using a pictorial scale to establish well-being around half of the children described themselves as very happy with under 5% describing themselves as very unhappy.

To determine the well-being according to BMI classification it was necessary to collapse the table by combining thin with healthy children and overweight with obese children to make two weight categories, this revealed that fewer overweight and obese children described themselves as happy and were more likely to describe themselves as unhappy. These results are comparable to the findings of previous studies that have reported lower self-esteem and global self-worth in obese children (Franklin *et al.,* 2006).

### 3.6.4 Anthropomery

Results of the anthropometric measurements and the prevalence of obesity of children in the baseline study are provided in chapter 5.

### 3.6.5 In summary

Intake of fruit and vegetables was low with only a third of children reporting eating fruit every day and a quarter including vegetable with their meals. Boys were less likely to consume fruit or vegetables. Children commonly consumed high fat and high sugar foods as snacks and also as part of their packed lunches and at breakfast.

A high proportion of children walked to and from school, some gender differences were noted in the types of playtime and sporting activities undertaken. Nearly half of the children also reported regular sedentary behaviour of television viewing and playing computer games being more likely in boys.

Body shape dissatisfaction was evident in both boys and girls with a third of boys and 45% of girls indicating they wanted to be thinner. Up to a fifth of children in both schools reported that they worried a lot about being called names or being made fun of. There was no difference in the responses of children according to their BMI classification but a significant difference was observed between gender with girls more likely to be worried than boys. Around half of the children in all schools chose the very happy stylized face to describe themselves with few children choosing the unhappy or very unhappy face. There was no difference in the responses of boys and girls but a significant difference was observed according to BMI classification. Overweight and obese children were less likely to describe themselves as happy and more likely to describe themselves as unhappy

compared to thin and healthy weight children. These results indicate that there is a need to check that any intervention does not unintentionally create negative psychological problems and that these potential effects should be monitored and the section on well being should continue to be included in the subsequent questionnaire.

# CHAPTER 4

# INTERVENTION

## 4.0 Intervention

The aim of the intervention was to promote healthier lifestyles for children focusing on children's eating habits with particular regard to intake of fruit and vegetables, eating breakfast and healthy snacks. The health promotion activities were then evaluated by the effect of the intervention on behaviour by collecting data on eating patterns, body shape dissatisfaction and psychological well being after intervention and comparing with the baseline.

### 4.1 Design of intervention

Following analysis of the baseline results an education pack was produced for schools that was specific to Bexley and in line with the national curriculum (key stage 2). The aim was to promote healthier lifestyles for children focusing on diet as the results of the baseline survey indicated that Bexley children were less likely to eat breakfast, had low intake of fruit and vegetables and consumed high fat and high sugar foods as snacks and as part of their packed lunches and breakfast. It was also decided to include aspects of increasing activity as part of the education pack as nearly half of the children reported regular sedentary behaviour of television viewing and playing computer games, being more likely in boys.

The education pack was based on the 'Eat 2B Fit' pack produced by the British Dietetic Association (2003). This was chosen because it already covered topics identified from the baseline survey as areas to target i.e. what was eaten for breakfast, snack foods and low intake of fruit and vegetables. The pack was adapted for Bexley children and entitled, **Be**

**healthy** (**Be**xley **h**ealthy **e**ating **a**ctive **l**ifestyle by **t**eaching **h**ealth for **y**oungsters). Extra resources for each session were included that children could take home, (appendix 4) . The materials were a mixture of curriculum- based and extra-curricular activities.

### 4.2 Be Healthy intervention programme and behaviour change theories

The **Be healthy** programme was developed using the Social Cognitive Theory model (Bandura 1986). This model has previously been used in school based interventions in the USA (Gortmaker et al., 1999b, Baranowski et al., 2000) with particular emphasis on increasing a child's self efficacy. The Social Cognitive Theory model considers the importance of personal factors such as an individual's knowledge and expectations in influencing behaviour change but also recognizes the impact that external factors have on an individual's behaviour e.g. availability and accessibility. The programme seeked to involve parents as they are the gatekeepers to the provision of food to children of this age group and the baseline survey indicated that they play an important role in food selection especially for packed lunches and the evening meal. For children the influence of the environment and the views of peers is an important aspect of behaviour change.

Table 25 provides a breakdown of the various components of the **Be healthy** programme, the process of behaviour change and the strategies employed in the programme for each component.

**Table 25 Behaviour change techniques and strategies for the Be healthy programme**

| Component of programme | Process of behaviour change | Summary of strategies used |
|---|---|---|
| Engaging schools, children and families with project | Establish motivation and create a receptive environment prior to project | ▪ Meeting with headteacher to discuss project and benefits to school.<br>▪ Communicate aim of project with parents and seek their support.<br>▪ Parental questionnaire. |
| Continued engagement with parents | Receives reinforcement from family, peers and teachers. | ▪ Resources and activities taken home as part of the programme, homework to support lessons.<br>▪ Lessons chosen so that children discuss messages with parents.<br>▪ Healthy lunchbox session offered to parents as part of programme. |
| Increasing knowledge of children on healthy eating | Establish motivation and skills. | ▪ Children learn about healthy eating messages through individual and group tasks during specific lessons on healthy eating, fruit and vegetables, breakfast, snacks, lunchbox and food and activity. |
| Reflect child's snacking and behaviour choice | Self efficacy-confidence in ability to assess own behaviour. | ▪ Food diary/records as part of lessons 1, 2, 3 and 6. |
| Tasting different fruit and vegetables | Self efficacy-confidence to try new snacks.<br>Peer support. | ▪ Interactive lesson including guessing names of fruit and vegetables and trying 4 different fruit or vegetables. |
| Select and try fruit and vegetables as part of school meals or snacks | Self efficacy- shows confidence to select fruit and vegetables.<br>Perceived norms-perceives other pupils selecting healthy alternatives. | ▪ Increase availability and accessibility of fruit and vegetables at lunchtime.<br>▪ Deliver a fruit tuck shop at playtimes.<br>▪ Display posters on fruit and vegetables in the canteen. |
| Children identify active alternatives to sedentary activities | Self efficacy-confidence in trying alternative activities. | ▪ Specific lessons focusing on activities identified by children on how they can be more active. |
| Children participate in activities at playtime | Perceived norms-perceives other pupils participating in activities | ▪ Playground equipment available for children to use during playtimes |

### 4.3 Be healthy intervention programme

Teachers from the intervention schools were provided with the **Be healthy** packs and given guidance on their use by means of a short training session with the classroom teachers prior to the intervention period at each school. The lesson plans and activities to be recommended were discussed during the meeting and the teachers were asked to complete an evaluation sheet for each lesson (appendix 4). Each school was also asked to complete an overall evaluation sheet of the **Be healthy** pack at the end of the intervention period.

#### 4.3.1 Contents of Be healthy intervention programme

The curriculum-based sessions were designed to be used by the class teachers over the Spring and Summer term, with two sessions on nutrition and one session on activity per half term. The resources provided were linked to the existing science, design and technology and PSHE curriculum areas. The physical activity theme would be included in 1 PE lesson each half term. A total of 9 sessions over the spring and summer terms.

The topics to be covered and a summary of the learning objectives for each curriculum-based session are provided in Table 26.

**Table 26 Be healthy session titles and summary of learning objectives**

| Title of session | Summary of learning objectives |
|---|---|
| 1. Balance of good health | ▪ Understand concept of healthy eating.<br>▪ Be aware of the right proportions for a balanced diet. |
| 2. Fruit and vegetables | ▪ Understand 5 a day message.<br>▪ Demonstrate how to incorporate fruit and vegetables in their daily diet. |
| 3. Breakfast | ▪ Understand the importance of a healthy breakfast.<br>▪ Knowledge of how to plan a healthy breakfast. |
| 4. Snacks | ▪ Describe the importance of choosing healthy snacks.<br>▪ Analyse food labels for fat and sugar content. |
| 5. Lunchboxes | ▪ Understand what makes a healthy lunchbox.<br>▪ Create a leaflet or poster promoting healthier lunchboxes for use in schools. |
| 6. Food and activity | ▪ Understand the relationship between food and energy.<br>▪ Ability to identify starchy foods and their importance in providing energy for the body. |
| 7. Can you be active on your own | ▪ Practical examples of how to increase activity at home or on your own |
| 8. Can you be active with friends | ▪ Practical examples of how to be active with friends or in the playground |
| 9. Let's get physical | ▪ Record activity over a 6 week period |

Each nutrition session had one main activity that was to be included by all schools and extra activities that could be used if time permitted (Intervention pack). Evaluation sheets for each session were included.

The activity sessions focused on how children could be more active using ideas based on the British Heart Foundation 'Let's get physical pack' (2004). In the first two half terms teachers were asked to introduce the concept of how to be active at home or on your own, and how to be active in the playground or with friends in physical education lessons. The

first half term of summer focused on generally increasing activity over a six week period using a physical activity diary produced by the British Heart foundation.

The extra-curricular activities included talks to the children by the researcher on healthy eating, focusing on fruit and vegetables and encouraging activities based on handling and tasting different fruit and vegetables. This talk was delivered to each school as a classroom activity. Sessions to parents on lunch box ideas were also offered to all schools and taken up and delivered in two schools.

Schools were also encouraged to provide playground equipment to promote children to be active during playtimes and to promote a school policy on healthy snacks at playtime. Improving the availability and accessibility of fruit and vegetables was planned by asking schools to consider starting a fruit tuck shop during playtime and they were provided with details of suppliers and potential cost. Most schools were interested in the tuck shop idea but it was not implemented in any school due to perceived difficulties with storage of fruit and handling cash. Increasing the quantity of fruit and vegetables available with the school meal was proposed but this was not possible due to the constraints of the existing catering contract. Schools were asked to promote healthier choices at lunchtime by displaying posters on fruit and vegetables in the canteen which were supplied to each school.

The cost of the **Be healthy** pack (folder and inserts) was approximately £15 per class or 50p per child and was funded by the study.

### 4.4 Timeline of the intervention

Jan 2005 → → July 2005

| | Spring<br>1st ½ term | Spring<br>2nd ½ term | Summer<br>1st ½ term | Summer<br>2nd ½ term |
|---|---|---|---|---|
| Curriculum-based nutrition sessions | (**1**)Healthy eating<br>(**2**)Fruit and vegetables | (**3**)Breakfast<br>(**4**)Snacks | (**5**)Lunchboxes<br>(**6**)Food and activity | |
| Curriculum-based activity sessions | (**1**)Active at home or on your own | (**2**)Active in the playground or with friends | (**3**)Increasing activity over 6 weeks | |
| Extra curricular sessions | | Talk on fruit and vegetables | Lunchbox session to parents | |
| Survey | | | | Repeat of baseline survey |

### 4.5 Discussion of theoretical aspects of design and evaluation

The information on the eating habits of children in Bexley indicated that one of the key areas of the diet the **Be healthy** intervention needed to focus was on increasing fruit and vegetable intake. Following a literature research on theoretical models used to improve fruit and vegetable intake in children the social cognitive theory appeared to have been utilized in school-based interventions with children of this age group (Baranowski et al., 2000). The intervention was designed to reflect the determinants of fruit and vegetable intake using the social cognitive theory constructs and incorporated personal and environmental factors, as indicated in Table 25. A review of interventions to improve

fruit and vegetable intake of children aged 6-11 years by Gaines and Turner (2009) stated that interventions that had a positive impact on behaviour change were theory driven and focused on specific food-related behaviours. Blanchette and Brug (2005) in their review on the determinants of fruit and vegetable consumption in children aged 6-12 years concluded that interventions that combined classroom curriculum, parent and food service components appeared to be the most effective.

As indicated in section 4.4 it was not possible to implement the environmental factors to increase availability and accessibility of fruit and vegetables of the **Be healthy** intervention.

### 4.6 Control and intervention schools

Nine primary schools participated in the baseline survey. From these schools five schools in the north of the borough were chosen to receive the intervention with four schools in the east and south east of the borough acting as controls. The control and intervention schools were comparable for size of schools, total number of children and level of social disadvantage (reflected by numbers of free school meals). The intervention and control schools were distinct and separated from each other to prevent possible contamination. Although selected and matched by size and social disadvantage the baseline survey had indicated some difference in eating and activity patterns of children. These differences were noted in the baseline results (chapter 3) and taken into consideration when interpreting the results of the intervention in chapter 5. The intervention schools conducted the **Be healthy** programme over the Spring and Summer terms while the control schools continued with their normal school curriculum. One school declined to act as an

intervention school as they believed they were already implementing areas covered in the intervention but agreed to take part in the repeat survey.

Parents from the intervention schools were informed of the decision by their school to participate in the **Be healthy** study prior to the intervention period and were asked for their views on what might be included as part of the programme by completing a questionnaire, (appendix 1). The majority of parents supported the proposed aims of the project and no changes to the programme were deemed necessary, it was decided to include all aspects in the project either as part of the curriculum or as extra-curricular activities. The results of this questionnaire were provided to the schools together with details about the proposed extra-curricular activities (appendix 1).

### 4.7 Evaluation of the intervention programme

The intervention was evaluated following the repeat of the baseline survey at the end of the Summer term 2005.

At the end of the intervention period teachers in two schools provided feedback on individual lessons via interviews with the researcher and feedback was obtained from all schools on the overall delivery of the **Be healthy** programme by the completion of questionnaires. Participating teachers in all schools reported covering all sessions during the intervention period, the feedback obtained from individual teachers indicated that the children had enjoyed the sessions and some teachers reported that they would continue with some of the sessions.

# CHAPTER 5

# RESULTS

## 5.0 Study sample

### 5.1 Characteristics of schools

All nine remaining schools participated in the baseline and repeat survey and six of these in the final survey. The characteristics of the nine schools that participated in the survey are included in Table 27.

All children in years 5 and 6 (aged 9-11years) were eligible to take part in the survey, with approximately 770 children enrolled in those school years. The parental consent rate varied between the schools with rates varying from 28% to 100%, with an average at baseline of 83%. If parental consent was not obtained children did not participate in the survey although one school decided that all children could complete the questionnaire but anthropometric measurements were not made.

A total of 1360 questionnaires were completed by children in these age groups, 646 at baseline, 312 at repeat and 402 at the final survey and 821 of these children were also measured for weight and height, 536 at baseline and 285 at the repeat survey.

**Table 27 Characteristics of schools in the intervention phase of the study**

| Characteristics of schools at baseline survey | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Ward** | **School Number** | **Intervention or control** | **Intake per year** | **Healthy School** | **Breakfast club** | **Bexley Excellence cluster*** | **National fruit scheme** | **Healthy pack lunch pilot**** | **% free school meals** | **Charlton Football club***** |
| **Thamesmead** | 3 | Intervention | 40 | Yes | No | No | No | No | 68 | No |
| | 4 | Control | 30 | Yes | No | Yes | Yes | No | 52 | Yes |
| | 2 | Intervention | 60 | No | No | Yes | Yes | No | 34 | Yes |
| **Belvedere** | 10 | Intervention | 60 | Yes | No | Yes | Yes | Yes | 35 | No |
| | 8 | Intervention | 80 | Yes | No | No | Yes | No | 14 | No |
| **Northend** | 7 | Control | 30 | No | No | Yes | Yes | No | 47.9 | No |
| | 5 | Control | 90 | No | No | Yes | Yes | No | 35 | Yes |
| **Cray** | 1 | Control | 45 | No | No | No | Yes | No | 22 | No |
| **Crayford** | 6 | Control | 60 | Yes | Yes | Yes | Yes | Yes | 44 | Yes |

*schools part of borough programme to improve key stage 2 and 3 skills
**schools participated in the British Nutrition Society packed lunch pilot
***schools participated in the 6 week Charlton football club healthy lifestyles and coaching scheme which included 30 minutes on healthy eating

This section provides details on the age, gender and ethnic description for the children that took part at each survey and separated into intervention and control schools.

## 5.2. Subject characteristics

### 5.2.1. Age and gender

A similar distribution of children according to age and gender was seen in both types of schools at all survey rounds. Details of the 638 children (332 boys and 306 girls) that participated in the baseline survey, 308 (147 boys and 161 girls) in the repeat and 396 (199 boys and 197 girls) in the final survey are provided in Table 28. Mean age of the children participating in the surveys ranged from 10.7 to 10.9 years.

**Table 28 Age and gender of children participating at each survey**

| | **Baseline** | | **Repeat** | | **Final** | |
|---|---|---|---|---|---|---|
| | Number | Age (years) Mean ± SE | Number | Age (years) Mean ± SE | Number | Age (years) Mean ± SE |
| Intervention | | | | | | |
| Males | 150 | 10.69 ±.049 | 82 | 10.94 ± .073 | 139 | 10.82 ± .054 |
| Females | 152 | 10.65 ± .045 | 84 | 10.91 ± .071 | 127 | 10.89 ± .052 |
| Total | 302 | 10.67 ± .033 | 166 | 10.92 ± .05 | 266 | 10.85 ± .037 |
| Control | | | | | | |
| Males | 182 | 10.62 ± .048 | 65 | 10.78 ± .077 | 60 | 10.92 ± .077 |
| Females | 154 | 10.72 ± .046 | 77 | 10.89 ± .067 | 70 | 11.05 ± .075 |
| Total | 336 | 10.67 ± .034 | 142 | 10.84 ± .051 | 130 | 10.99 ± .054 |

SE – standard error

### 5.2.2. Ethnic composition

The children were provided with 10 options to describe their ethnic background, as used by the Children's Fund, the majority of children (up to 78%) described themselves as White with Black African and Black the next highest most common ethnic backgrounds chosen by the children. Full details for the intervention and control schools are provided in Table 29.

**Table 29 A comparison of the ethnic background of children in intervention and control schools for each survey round**

| | | Intervention | | | Control | | |
|---|---|---|---|---|---|---|---|
| | | **Baseline** | **Repeat** | **Final** | **Baseline** | **Repeat** | **Final** |
| | | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) |
| Ethnic background of children | | | | | | | |
| | White | **65.0** (197) | **65.5** (108) | **61.2** (164) | **78.1** (261) | **69.7** (99) | **61.5** (80) |
| | Black | **3.3** (10) | **7.3** (12) | **10.1** (27) | **2.7** (9) | **4.9** (7) | **2.3** (3) |
| | Black African | **12.9** (39) | **12.7** (21) | **13.8** (37) | **5.7** (19) | **7.7** (11) | **15.4** (20) |
| | Black Caribbean | **0.7** (2) | **1.8** (3) | **1.5** (2) | **0.9** (3) | **0** | **1.5** (2) |
| | Asian | **1.0** (3) | **1.2** (2) | **1.1** (3) | **0.6** (3) | **2.1** (3) | **0.8** (1) |
| | Bangladeshi | **0** | **0** | **0** | **0** | **0.7** (1) | **0.8** (1) |
| | Indian | **5.0** (15) | **1.2** (2) | **2.2** (6) | **1.5** (5) | **1.4** (2) | **0** |
| | Pakistani | **0.7** (2) | **0** | **0.4** (1) | **0** | **0** | **0** |
| | Chinese | **2.6** (8) | **0.6** (1) | **0.4** (1) | **1.8** (6) | **0.7** (1) | **6.9** (9) |
| | Other | **8.9** (27) | **9.7** (16) | **9.3** (25) | **8.7** (29) | **12.7** (18) | **10.8** (14) |
| | Total | **303** | **165** | **268** | **334** | **142** | **130** |

As several of the options provided to describe ethnic background were chosen by only a few children the categories were recoded into 4 groups, White, Black, Other and Asian and these were used in further analysis of the data.

At baseline in the intervention and control schools 72% of all children described themselves as White, the second highest ethnic background was Black (13%) with Other 11% and Asian 4%.

Differences were observed between intervention and control schools with a significantly higher ($p<0.001$) proportion of White pupils in the control schools at baseline. The proportion of Black children increased in both intervention and control schools between surveys but the difference within schools only reached significance in the control schools (<0.007) (Table 30).

**Table 30 Comparison of ethnic description of children in intervention and control schools for each survey round**

| | | Intervention | | | Control | | | P value |
|---|---|---|---|---|---|---|---|---|
| | | **Baseline** | **Repeat** | **Final** | **Baseline** | **Repeat** | **Final** | |
| | | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | |
| Ethnic description of children | | | | | | | | |
| | White | **65.0**(197)* | **65.5** (108) | **61.2** (164) | **78.1**(261)* | **69.7** (99) | **61.5** (80) | |
| | Black | **16.8** (51) | **21.8** (36) | **25.4** (68) | **9.3** (31) | **12.7** (18) | **19.2**(25)** | <0.001 B |
| | Other | **11.6** (35) | **10.3** (17) | **9.7** (26) | **10.5** (35) | **13.4** (19) | **17.7** (23) | <0.007 C |
| | Asian | **6.6** (20) | **2.4** (4) | **3.7** (10) | **2.1** (7) | **4.2** (6) | **1.5** (2) | |
| | Total n | **303** | **165** | **268** | **334** | **142** | **130** | |

B-Baseline survey *$X^2$ =20.639; df = 4; p<0.001 C- Control schools ** $X^2$ =21.252; df = 8; p<0.007

## 5.3 Eating habits

The results presented here focus on the main areas of interest which were eating breakfast, foods included in a packed lunch, snacking between meals and fruit and vegetable intake as these were areas targeted in the intervention study. Results are given for baseline (B) and any changes within the intervention schools at the end of the intervention period (R) and 1 year later (F) and how this compared to the control schools. Any significant differences found between the intervention and control schools in the baseline survey (details in chapter 3) are highlighted in the current chapter.

Few differences in the eating habits of children were observed according to gender and BMI classification in survey rounds. When significant differences were found details are provided.

The results are separated into meals, snacks and who influences what children are eating at mealtimes. A section on specific foods targeted in the intervention is also included which is the intake of fruit, crisps and chocolate.

### 5.3.1 Meals

The proportion of children who ate breakfast, lunch or evening meal did not change between surveys and there were no significant changes between intervention and control schools. All children reported that they always ate lunch, the majority always consumed an evening meal and even though breakfast was the least popular meal, over two thirds of children always ate breakfast

### 5.3.1.1 Breakfast

At baseline, two thirds of children ate or drank something for breakfast everyday with few children never having something to eat or drink before starting school. There were no significant changes in whether breakfast was eaten within or between schools at any stage.

#### 5.3.1.1.2 Where children eat breakfast

In all surveys a higher proportion of children at intervention schools ate breakfast at home than children in control schools (Table31). The significant difference observed at baseline between schools (P<0.027) was not evident in the repeat and final surveys. Although the proportion of children eating breakfast at home increased from baseline values in all schools this only reached significance in the intervention schools (p<0.019).

**Table 31 A comparison of the proportion of children who eat breakfast at home in intervention and control schools in the baseline, repeat and final surveys.**

| | | Intervention | | | Control | | | P value |
|---|---|---|---|---|---|---|---|---|
| | | **Baseline** | **Repeat** | **Final** | **Baseline** | **Repeat** | **Final** | |
| | | **%** (n) | **%** (n) | **%** (n) | **%** (n) | **%** (n) | **%** (n) | |
| Eating breakfast at home | | | | | | | | |
| | Always | **74.6** (214) | **81.5** (132) | **79.3** (199) | **67.5** (218) | **73.2** (101) | **71.4** (90) | |
| | Sometimes | **23.0** (66)* | **18.5**(30) | **20.7** (52) | **31.6**(102)* | **25.4** (35) | **27.8** (35) | .027 B |
| | Never | **2.4** (7) | **0** (0) | **0** (0)** | **0.9** (.3) | **1.4** (2) | **0.8** (1) | .019 I |
| | Total | **100.0**(287) | **100.0**(162) | **100.0**(251) | **100.0**(323) | **100.0**(138) | **100.0**(126) | |

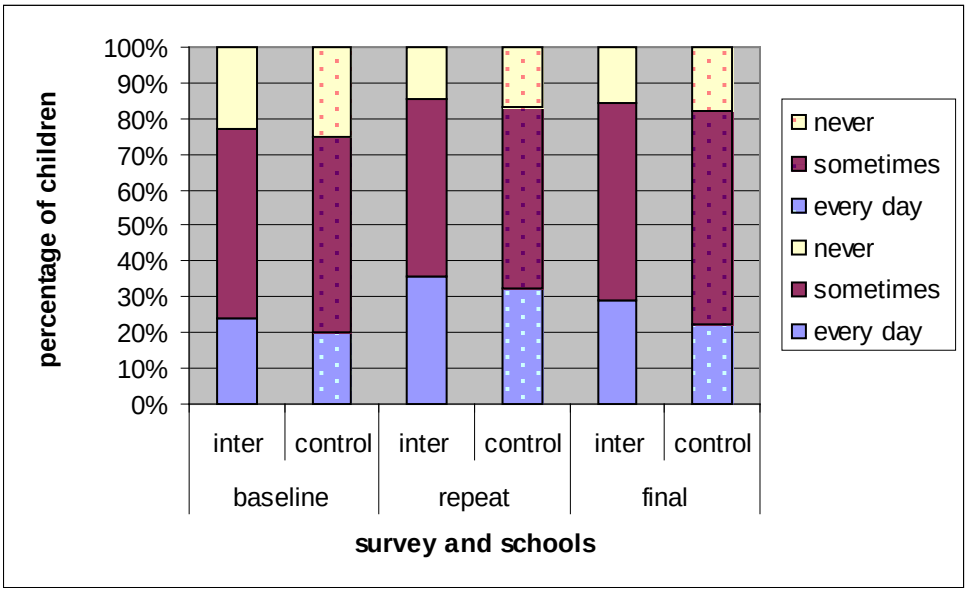
B-Baseline survey *$X^2$ =7.252; df = 2; p<0.027 I- Intervention schools ** $X^2$ =11.827; df = 4; p<0.019

#### 5.3.1.1.3 What children ate for breakfast

No significant differences were observed between intervention and control schools in what children ate for breakfast in the repeat survey but differences were observed within schools over time.

A similar pattern in fruit intake at breakfast was observed in both types of school between surveys. At baseline just under a quarter of children chose fruits everyday, this increased to a third of children in the repeat survey, but this increase was not sustained in the final survey with levels falling but still remaining above baseline values in all schools. The changes in fruit intake between surveys resulted in a smaller proportion of children never including fruit at breakfast in the repeat and final survey compared with the baseline. These differences between surveys reached significance in the control schools ($p<0.043$) and a similar trend was seen in the intervention schools but did not reach significant levels ($p<0.060$) (Figure 16).

**Fig 16 Frequency of consumption of fruit for breakfast in intervention and control schools in the baseline, repeat and final surveys.**



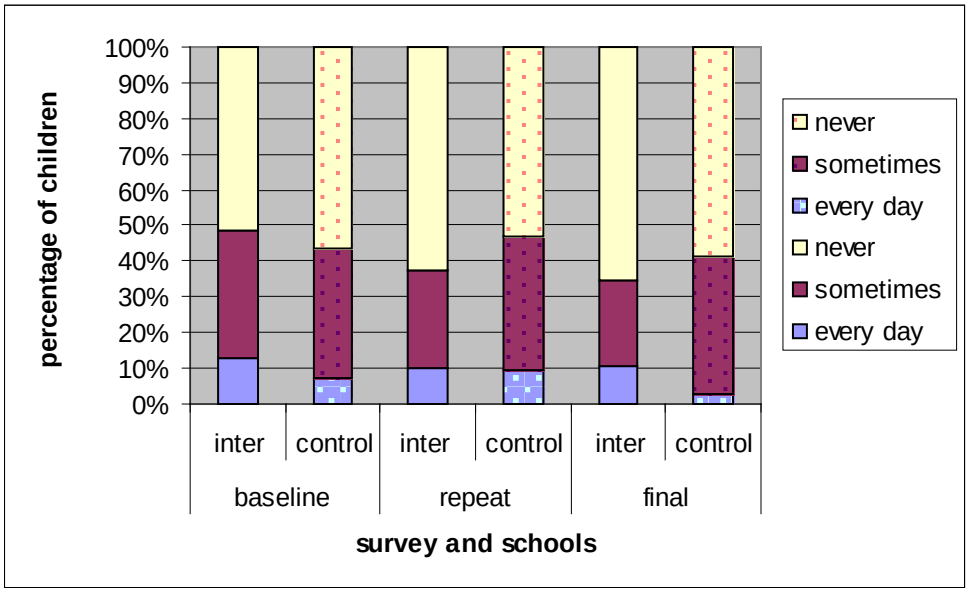

Control schools $X^2=9.848$; df = 4; $p<0.043$

At baseline a significant difference was seen between gender with nearly twice as many girls eating fruit at breakfast compared to boys in all schools. In the repeat and final

survey no difference was observed in the fruit intake of boys and girls at breakfast in all schools due to an increase in the proportion of boys who ate fruit.

A significant reduction in the proportion of children eating crisps at breakfast was seen in the intervention schools over time (P<0.037), this was a result of a small reduction in those eating crisps everyday, together with a decrease in those sometimes eating crisps, resulting in nearly two thirds of children in the intervention schools never eating crisps at breakfast. In the control schools the percentage that chose crisps everyday decreased in the final survey but overall the proportion of children who sometimes or never ate crisps remained virtually unchanged for all surveys (Figure 17).

**Fig 17 Frequency of consumption of crisps for breakfast in intervention and control schools in the baseline, repeat and final surveys.**

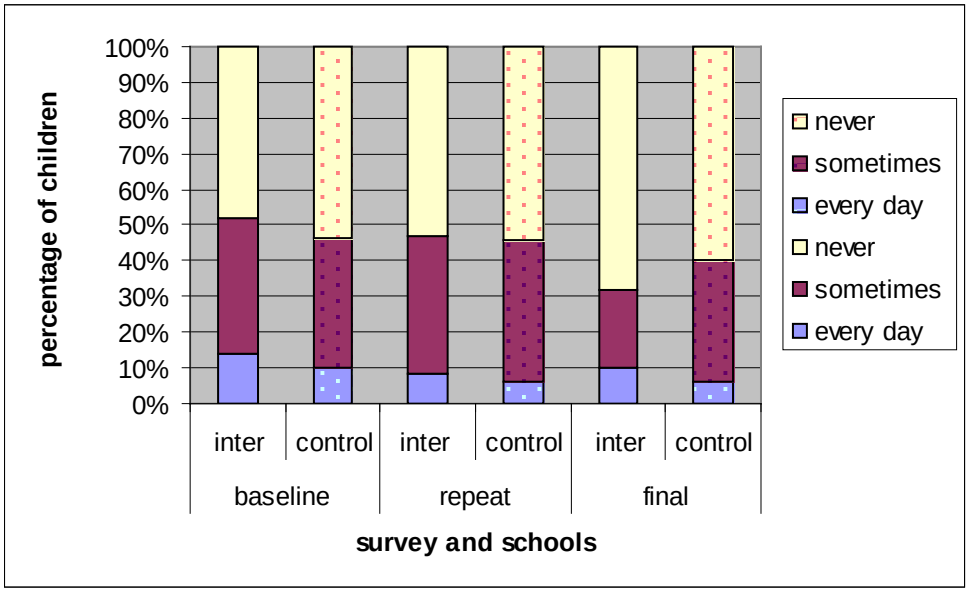



Intervention schools $\chi^2$=10.205: df = 4; p<0.037.

Chocolate intake at breakfast decreased significantly between surveys in the intervention schools, with the percentage of children never eating chocolate at breakfast increasing

from half to over two thirds in the final survey ($p<0.001$). In contrast no significant change was observed in the control schools (Figure 18).

**Fig 18 Frequency of consumption of chocolate for breakfast in intervention and control schools in the baseline, repeat and final surveys.**




Intervention schools $X^2 = 20.442$; df = 4; $p<0.001$

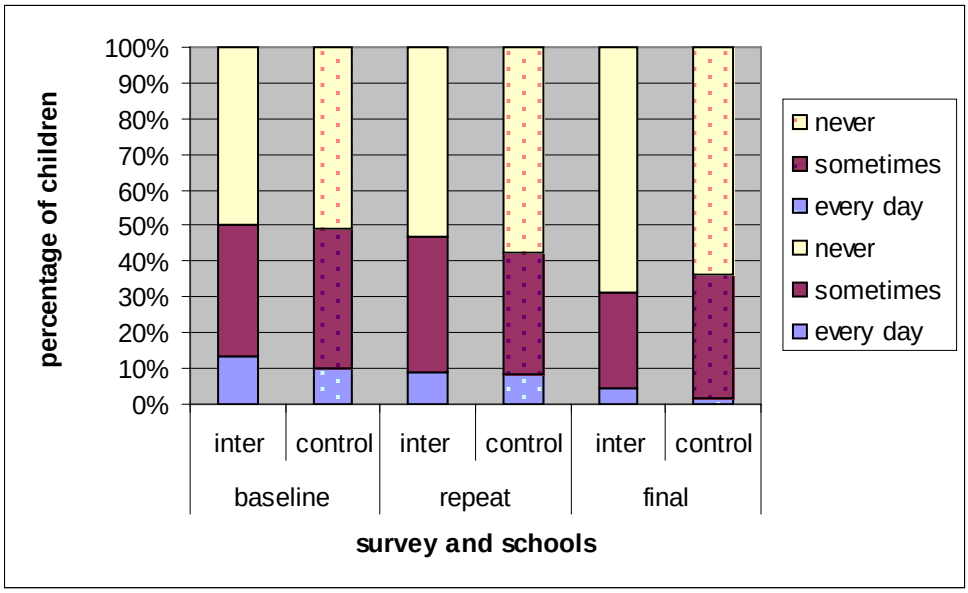
### 5.3.1.1.4 What children drank at breakfast

Children were asked to indicate how often they chose milk, fizzy drink or fruit juice at breakfast. The proportion of children drinking milk did not change but significant differences were observed in the choice of fizzy drinks and fruit juice at breakfast.

The frequency of fizzy drink consumption at breakfast changed over time with a reduction in the intervention schools in the children who chose fizzy drinks at breakfast ($p<0.001$). A similar pattern was also observed in the control schools ($p<0.036$). (Figure 19). No

significant differences were observed between intervention and control schools at any stage.

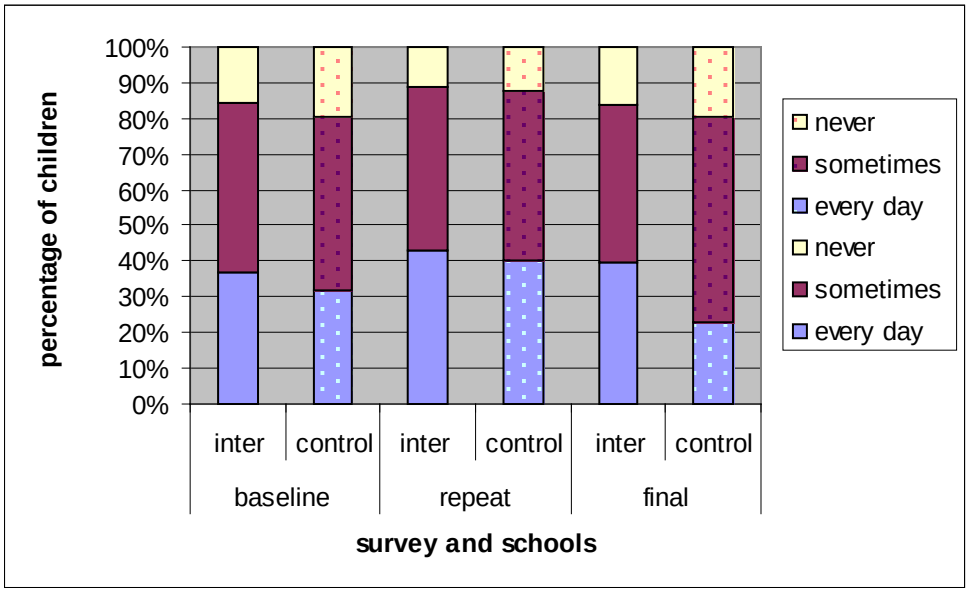
**Fig19 Frequency of consumption of fizzy drink for breakfast in intervention and control schools in the baseline, repeat and final surveys.**




Intervention schools $X^2$ =20.554; df = 4; p<0.001  Control schools $X^2$ =10.284; df = 4; p<0.036

A significant difference was observed in the choice of fruit juice at breakfast between the schools in the final survey (p<0.007) and also within the control schools between surveys (p<0.037). These differences were due to fewer children drinking fruit juice in the control schools in the final survey. No significant changes were observed in the intervention schools between surveys with over a third of children reporting to always drinking fruit juice at breakfast (Figure 20).

**Fig 20 Frequency of consumption of fruit juice for breakfast in intervention and control schools in the baseline, repeat and final surveys.**




Final survey $X^2$ =9.837; df = 2; p<0.007  Control schools $X^2$ =10.213; df = 4; p<0.037

### 5.3.1.1.5 The importance of breakfast

In the repeat and final surveys questions were included to assess the nutritional knowledge of the children, these included children's perceptions of the importance of eating breakfast. Children were asked to score the importance of eating breakfast from very important to not important on a 4 point scale.

A higher percentage of children in the intervention schools answered that breakfast was very important compared to the control schools in both the repeat and final surveys but this only reached significance in the final survey (p <0.041). This could indicate that the children had retained knowledge from the intervention (Table 32).

**Table 32 Comparison of children's responses on the importance of eating breakfast in intervention and control schools in the repeat and final surveys**

| | | Intervention | | Control | |
|---|---|---|---|---|---|
| | | Repeat | Final | Repeat | Final |
| | | **%** (n) | **%** (n) | **%** (n) | **%** (n) |
| Importance of eating breakfast | | | | | |
| | Very imp | **77.0** (127) | **70.8** (189)* | **64.8** (94) | **57.9** (73)* |
| | important | **15.1** (25) | **17.2** (46) | **17.9** (26) | **29.4** (37) |
| | Quite imp | **6.1** (10) | **10.9** (29) | **13.2** (19) | **11.1** (14) |
| | Not imp | **1.8** (3) | **1.1** (3) | **4.1** (6) | **1.6** (2) |
| | Total | **100.0** (165) | **100.0** (264) | **100.0** (145) | **100.0** (126) |

Final survey * $X^2$ =; df = ; p<0.041

Few children thought that eating breakfast was not important. However, when the importance of eating breakfast was compared to actual eating habits it was seen that the majority of children who thought eating breakfast was important were more likely to actually eat breakfast in both intervention and control schools. (Tables 33 and 34)

**Table 33 A comparison of children's perception of the importance of eating breakfast with actual eating habits at breakfast in intervention and control schools at the repeat survey.**

| | Intervention- Repeat survey | | | | Control -Repeat survey | | | |
|---|---|---|---|---|---|---|---|---|
| | Very important | Important | Quite important | Not very important | Very important | Important | Quite important | Not very important |
| | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) |
| Eat b'fast | | | | | | | | |
| Yes | **73.8** (90) | **72.0** (18) | **60.0** (6) | **33.3** (1) | **77.7** (73) | **61.5** (16) | **73.6** (14) | **50.0** (3) |
| No | **1.6** (2) | **0** | **0** | **0** | **2.1** (2) | **7.7** (2) | **5.3** (1) | **33.3** (2) |
| Sometimes | **24.6** (30) | **28.0** (7) | **40.0** (4) | **66.7** (2) | **20.2** (19) | **30.8** (8) | **21.1** (4) | **16.7** (1) |
| Total | **100.0**(122) | **100.0** (25) | **100.0** (10) | **100.0** (3) | **100.0** (94) | **100.0** (26) | **100.0** (19) | **100.0** (6) |

**Table 34 A comparison of children's perception of the importance of eating breakfast with actual eating habits at breakfast in intervention and control schools at the final survey.**

| | Intervention- Final survey | | | | Control -Final survey | | | |
|---|---|---|---|---|---|---|---|---|
| | Very important | Important | Quite important | Not very important | Very important | Important | Quite important | Not very important |
| | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) |
| Eat b'fast | | | | | | | | |
| Yes | **78.0** (145) | **67.4** (31) | **44.4** (12) | **0** | **71.2** (52) | **62.2** (23) | **42.9** (6) | **100.0** (2) |
| No | **1.6** (7) | **0** | **11.2** (3) | **33.3** (1) | **0** | **0** | **7.1** (1) | **0** |
| Sometimes | **20.4** (38) | **32.6** (15) | **44.4** (12) | **66.7** (2) | **28.8** (21) | **37.8** (14) | **50.0** (7) | **0** |
| Total | **100.0**(190) | **100.0** (46) | **100.0** (27) | **100.0** (3) | **100.0** (73) | **100.0** (37) | **100.0** (14) | **100.0** (2) |

### 5.3.1.2 Lunch

Children indicated whether they ate the school meal, brought in a packed lunch or went home for their lunch. In the intervention schools the percentage who ate a packed lunch

(67.3-70.9%) and school meal (29.1-32.7%) remained constant between surveys. In the control schools the percentage who ate packed lunches was lowest at baseline and was significantly different to the intervention schools (P<0.017) but increased in the repeat and final surveys so that frequency of packed lunch and school meal consumption were comparable to those found in the intervention schools. Very few children went home for lunch, with only 1 in the baseline survey and 3 in the final survey. (Table 35).

**Table 35 A comparison of children's eating habits at lunch in intervention and control schools in the baseline, repeat and final surveys.**

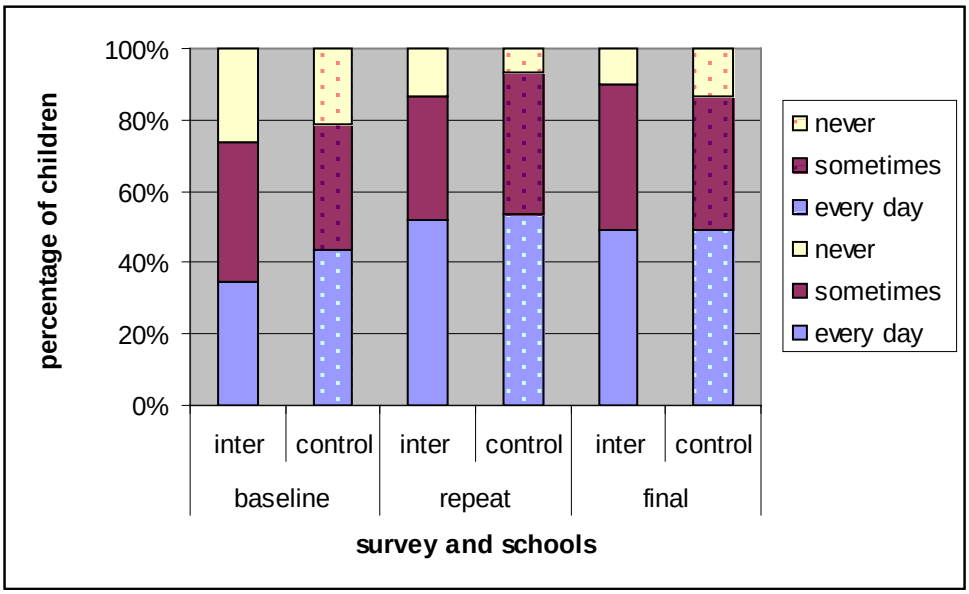
| | | Intervention | | | Control | | | P value |
|---|---|---|---|---|---|---|---|---|
| | | **Baseline** | **Repeat** | **Final** | **Baseline** | **Repeat** | **Final** | |
| | | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | |
| What type of lunch is consumed | | | | | | | | |
| | Pack lunch | **67.3**(202)* | **70.9** (117) | **69.1** (186) | **56.7**(190)* | **68.3** (97) | **66.2** (86) | |
| | School meal | **32.7** (98) | **29.1** (48) | **29.8** (80) | **43.0** (144) | **31.7** (45) | **33.8** (44) | <0.017 B |
| | Home | **0** (0) | **0** (0) | **1.1** (3) | **0.3** (1) | **0** (0) | **0** (0) | |
| | Total | **100.0**(300) | **100.0**(165) | **100.0**(269) | **100.0**(335) | **100.0**(142) | **100.0**(130) | |

B-Baseline survey *$X^2$ =8.207; df = 2; p<0.017

### 5.3.1.2.1 Packed lunch

The percentage of children who always included fruit in their packed lunch increased in all schools over time (p<0.001 I, p<0.050 C). The baseline values were lower in the intervention schools but at the repeat and final surveys the values were similar in all schools with nearly half the children including fruit everyday. A fifth to a quarter of all children never included fruit in their packed lunch at baseline, this proportion had decreased in the repeat survey and further decreased in the intervention schools so that in the final survey just over 10% of children never included fruit in their packed lunch compared with 26% at baseline. No significant differences were observed between schools at any survey. (Figure21).

**Fig 21 Frequency of consumption of fruit as part of a packed lunch in the baseline, repeat and final surveys in intervention and control schools.**




Intervention schools $X^2$ =20.477; df = 4; p<0.001 Control schools $X^2$ =9.467; df = 4; p<0.050

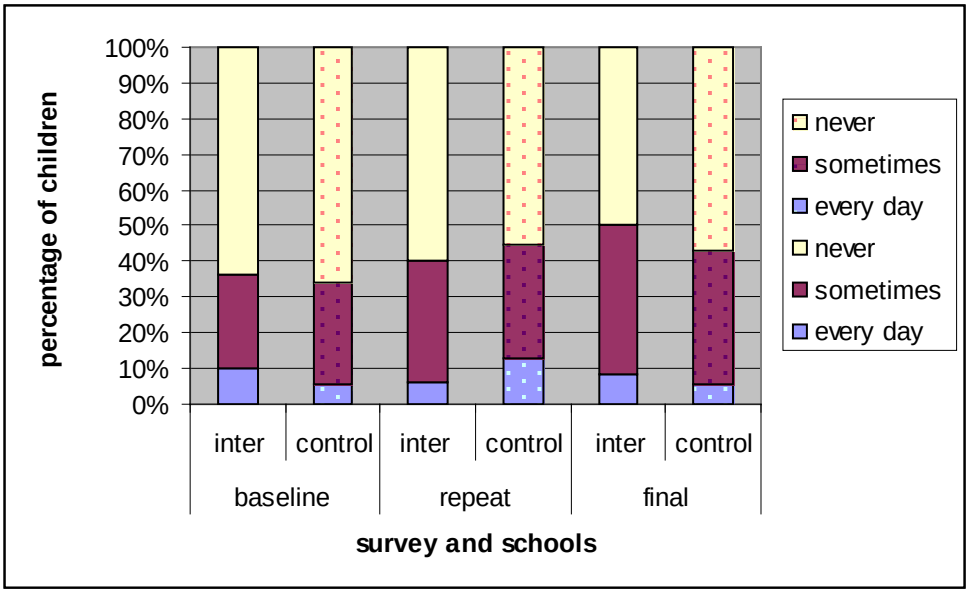
Significant differences were observed in the intake of fruit between boys and girls at baseline and in the repeat survey in the intervention and control schools.

In the intervention schools at baseline more boys always ate fruit as part of their packed lunch compared to girls but also more boys never ate fruit (p<0.023). In the repeat survey the percentage of boys that ate fruit remained the same but the percentage of girls who ate fruit more than doubled to 63.6%, (n =35). The percentage of boys and girls who never included fruit in their packed lunch had also decreased from 32.2% to 18.0%, (n =9) and 20.2% to 9.1%, (n =5) respectively, (p<0.050).

In the control schools at baseline fewer boys ate fruit and again more boys never ate fruit compared to girls, (p<0.035). In the repeat and final surveys no differences were found between fruit intake with around half of both boys and girls eating fruit in their packed lunch.

Few children included salad in their packed lunch everyday but a trend was observed that the percentage that sometimes included it increased over time in all schools (Figure 22).

**Fig 22 Frequency of consumption of salad as part of a packed lunch in the baseline, repeat and final surveys in intervention and control schools.**

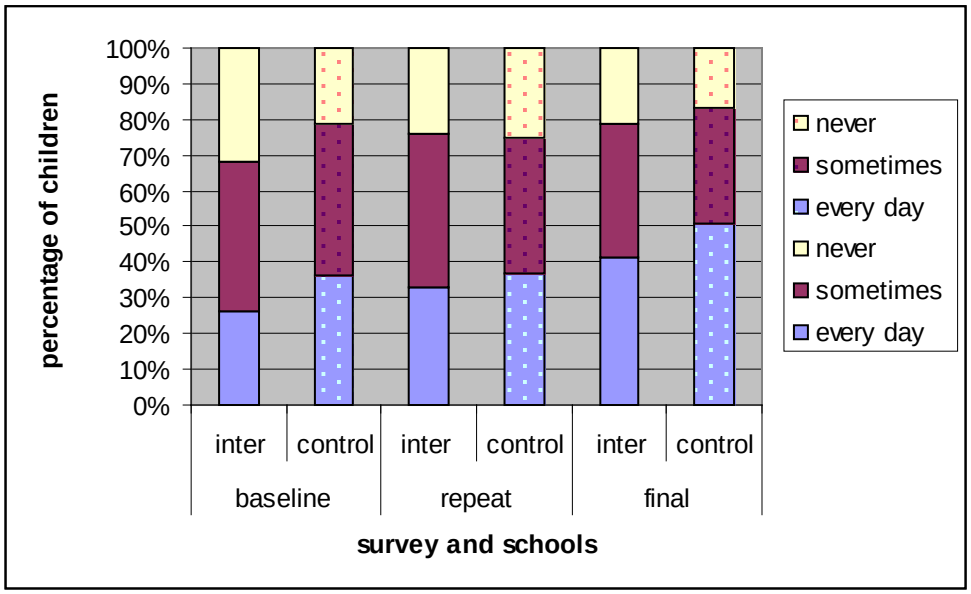



No changes were observed in the inclusion of crisps in the packed lunch between schools or between surveys and crisps remained the second most popular item included everyday by two thirds of children in all schools.

When intake of crisps for packed lunch was analysed by BMI classification a trend was observed that a higher percentage of thin/healthy children ate crisps compared to overweight/obese children. This difference reached a significant level in the intervention schools in the repeat survey where 65.3% (n = 47) of thin/healthy children ate crisps compared to 38.5% (n = 10) overweight/obese children ($p<0.031$).

At baseline significantly more children in the control schools included yoghurt in their packed lunch ($p<0.035$). Yoghurt consumption increased in both types of schools between surveys but only reached significance level in the intervention schools ($p<0.036$) so that the difference between schools was no longer significant in the repeat or final surveys. (Figure 23).

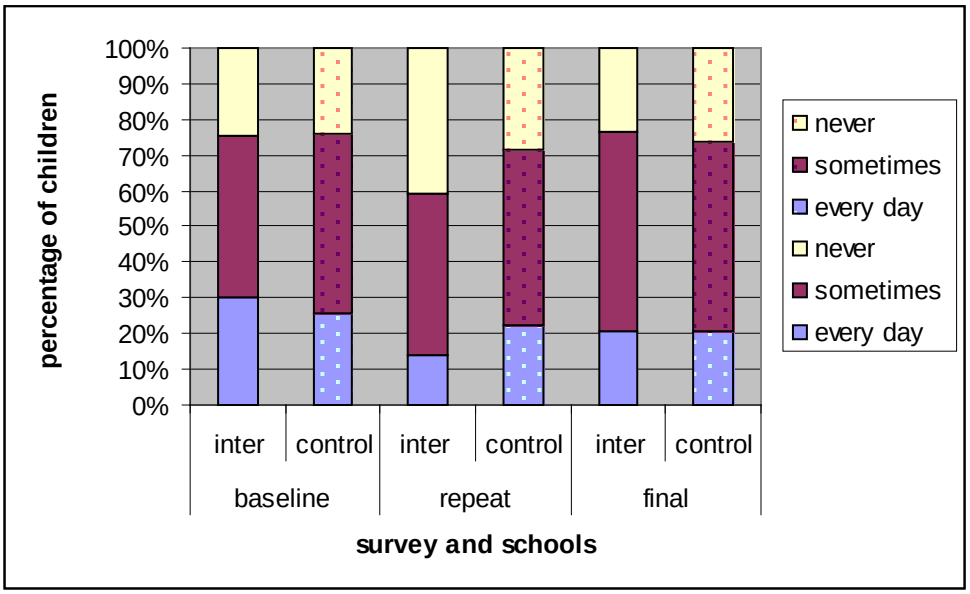
**Fig 23 Frequency of consumption of yoghurt as part of a packed lunch in intervention and control schools in the baseline, repeat and final surveys.**




Baseline survey $X^2=6.704$; df = 2; $p<0.035$ Intervention schools $X^2=10.280$; df = 4; $p<0.036$

In the intervention schools the percentage of children always including biscuit in a packed lunch significantly decreased between surveys, falling from nearly a third at baseline to13.9% in the repeat survey before increasing again in the final survey but still remaining 10% below baseline values ($p<0.001$). No change was found in the control schools between surveys and there was no significant difference between schools at any stage (Figure 24).

**Fig 24 Frequency of consumption of biscuit as part of a packed lunch in the baseline, repeat and final surveys in intervention and control schools.**



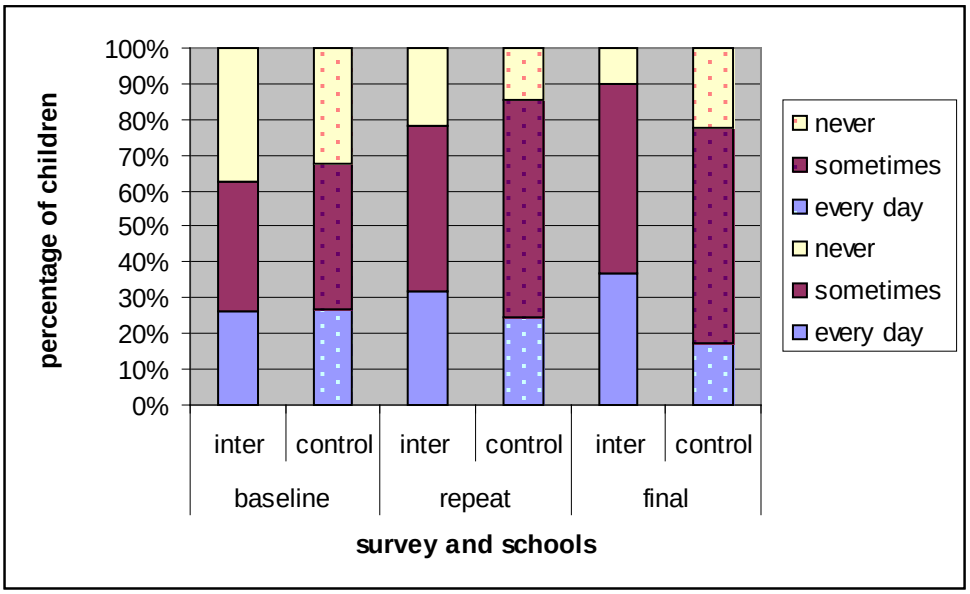

Intervention schools $X^2$ =18.014; df = 4; p<0.001

### 5.3.1.2.2 School meal

In the intervention schools there was a gradual increase in the percentage of children who always chose salad with their school meal between surveys, increasing from 26.1 to 37.1% and a reduction in those that never chose salads from 37.5 to10.0% (p<0.003).

In contrast in the control schools baseline values were similar to the intervention schools but the popularity of salad as part of the school lunch decreased over time. The difference between intervention and control schools reaching a significant level in the final survey (p<0.044) (Figure 25).

**Fig 25 Frequency of consumption of salad as part of school meal in the baseline, repeat and final surveys in intervention and control schools.**




Final survey $X^2$ =6.242; df = 2; p<0.044 Intervention schools $X^2$ =16.096; df = 4; p<0.003

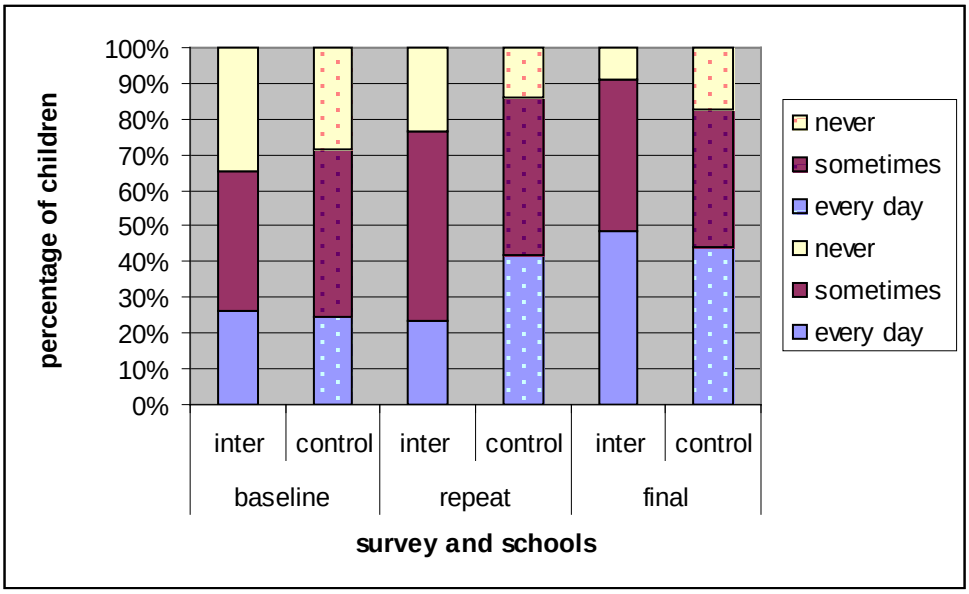
The choices made by the children for fruit and vegetables as part of their school meal was significantly different between surveys within schools but were not statistically significant between schools.

There were significant increases in reported vegetable intake by children in both types of schools across surveys. In the intervention schools nearly half of the children in the final survey always included vegetables with their school meal compare to a quarter at baseline. Also in the final survey fewer than 10% of children reported never choosing vegetables with their school meal, a reduction from 34.5% at baseline (p<0.001).

In the control schools the proportion of children who included vegetables also increased between surveys, but the percentage that never included vegetables in the final survey was

17.1% in the control schools compared to 9.1% in the intervention schools (p<0.050) (Figure 26).

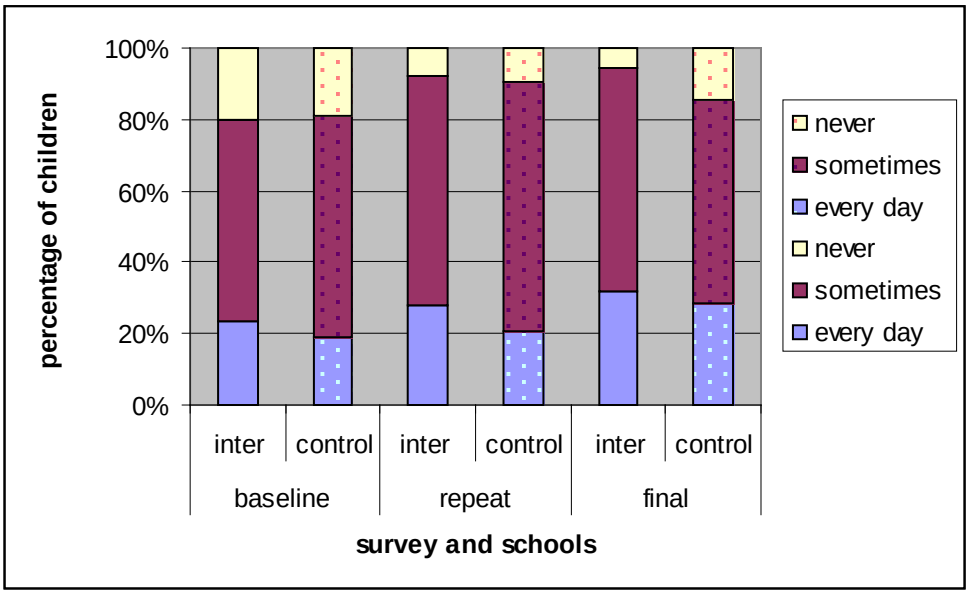
**Fig 26 Frequency of consumption of vegetables as part of school meal in the baseline, repeat and final surveys in intervention and control schools.**




Intervention schools $X^2$ =18.219; df = 4; p<0.001 Control schools $X^2$ =9.507; df = 4; p<0.050

The percentage of children who ate fruit as part of their school meal increased over time in all schools but the increase did not reach significant levels. In the intervention schools the percentage that never chose fruit also decreased over time, in the final survey only 5.8% indicated they never included fruit compared to 20.2% at baseline (Figure 27).

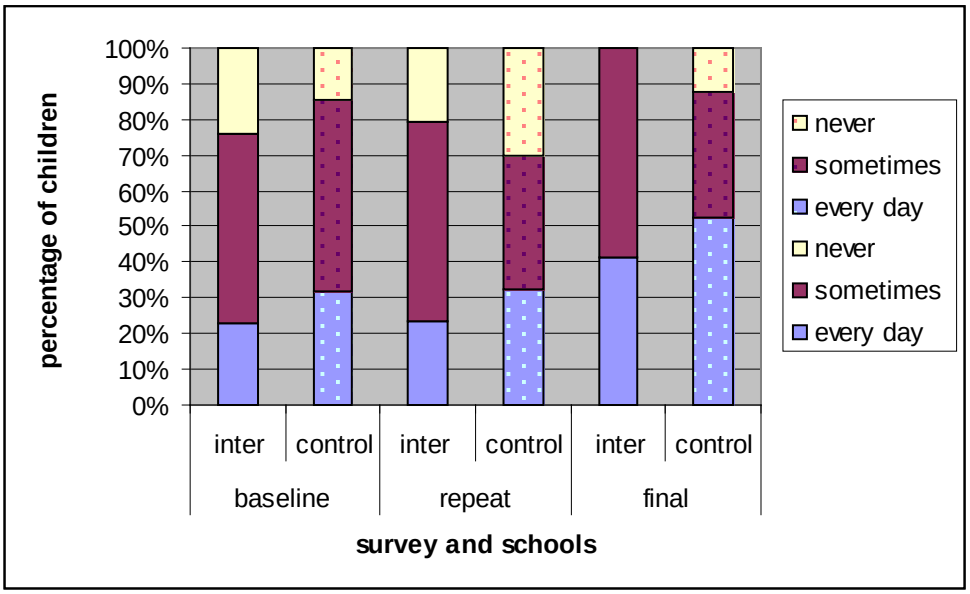
**Fig 27 Frequency of consumption of fruit as part of school meal in the baseline, repeat and final surveys in intervention and control schools.**




The percentage that included bread with their school meal differed between schools and between surveys ($p<0.001$). In the intervention schools nearly twice as many children ate bread in the final survey compared to baseline, and in the final survey every child included bread either everyday or sometimes with their school meal.

In the control schools a similar result was observed with an increase in the final survey to over a half of children always including bread with their school meal compared to a third at baseline, but 12.5% continued never to include bread as part of their meal (Figure 28).

**Fig 28 Frequency of consumption of bread as part of school meal in intervention and control schools in the baseline, repeat and final surveys.**

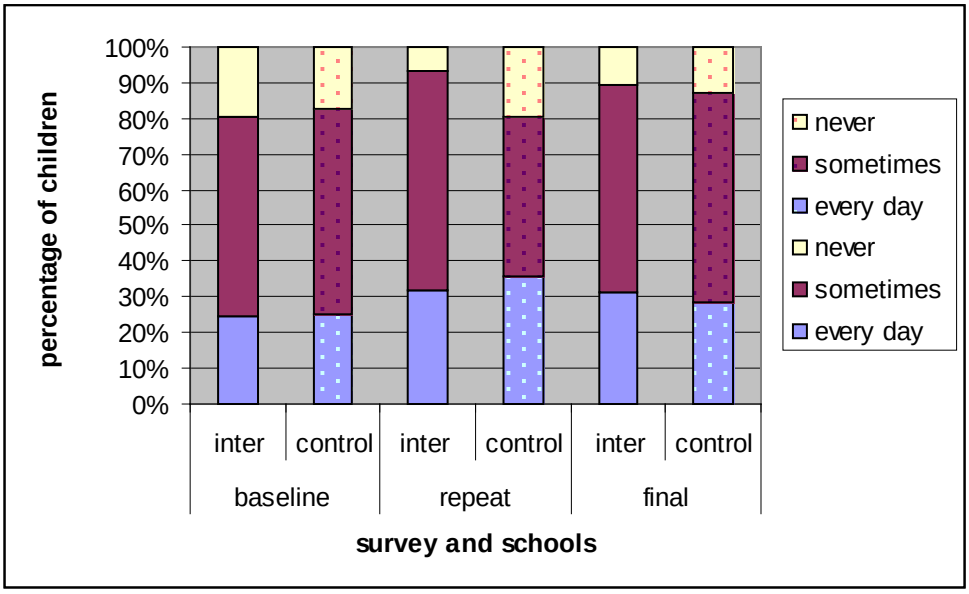



Intervention schools $X^2$ =21.072; df = 4; p<0.001  Control schools $X^2$ =12.290; df = 4; p<0.015

### 5.3.1.3 Evening meal

In the intervention schools the proportion of children who ate vegetables with their evening meal every night increased from a quarter to a third between surveys and those that never ate vegetables decreased by nearly a half (p<0.001). There was also a significant difference in vegetable consumption in the repeat survey between intervention and control schools (p<0.001) with a greater number in the intervention schools sometimes eating vegetables and very few never eating vegetables with their evening meal (Figure 29).

**Fig 29 Frequency of consumption of vegetables as part of the evening meal in the baseline, repeat and final surveys in intervention and control schools.**




Repeat survey $X^2$ =13.239; df = 2; p<0.001  Intervention schools $X^2$ =17.763; df = 4; p<0.001

In all schools at baseline more girls ate vegetables with their evening meals compared to boys. In the repeat and final survey no significant differences were observed between boys and girls with an increase in the percentage of boys eating vegetables to a level comparable to girls.

In all schools fruit intake did not alter between surveys with nearly a quarter of children eating fruit with the evening meal every night and a third of children never including fruit with their evening meal.

### 5.3.2 Snacks

Children were asked to indicate whether they ate snacks between meals and also what foods and drinks they chose. The afternoon was the most popular time to eat a snack with morning break being the least popular, this remained consistent in all surveys.

#### 5.3.2.1 Mid morning

In the intervention schools nearly a third of children included a snack every day and this did not change significantly with time. In the control schools baseline values were similar to the intervention schools but the proportion that included a snack every day rose slightly in the repeat survey but decreased in the final survey so that only 16.4% of children included a snack reaching significance between schools ($p<0.002$) (Table 36).

**Table 36 Proportion of children eating a snack at morning break in intervention and control schools in the baseline, repeat and final surveys.**

| | | Intervention | | | Control | | | P value |
|---|---|---|---|---|---|---|---|---|
| | | **Baseline** | **Repeat** | **Final** | **Baseline** | **Repeat** | **Final** | |
| morning snack eaten | | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | |
| | | | | | | | | |
| | Yes | **29.4** (87) | **32.1** (53) | **32.4** (85)* | **28.5** (93) | **37.3** (53) | **16.4** (21)* | |
| | No | **30.7** (91) | **25.5** (42) | **29.0** (76) | **25.2** (82) | **23.9** (34) | **30.5** (39) | 0.002 F |
| | Sometimes | **39.9** (118) | **42.4** (70) | **38.6** (101) | **46.3** (151) | **38.8** (55) | **53.1** (68) | 0.005 C |
| | | **100.0**(296) | **100.0**(165) | **100.0**(262) | **100.0**(326) | **100.0**(142) | **100.0**(128) | |

Final survey *$X^2$ =12.414; df = 2; $p<0.002$ Control schools *$X^2$ =14.934; df = 4; $p<0.005$

Significant differences on whether a mid-morning snack was eaten were seen in the repeat survey according to gender and BMI classification. In the control schools more girls (45.5%, n =35) compared to boys (25.4%, n =16) ate a mid-morning snack ($p<0.020$), whereas in the intervention schools the difference (34.9%, n =29 compared to 29.6%, n =24 respectively) did not reach a significant level.

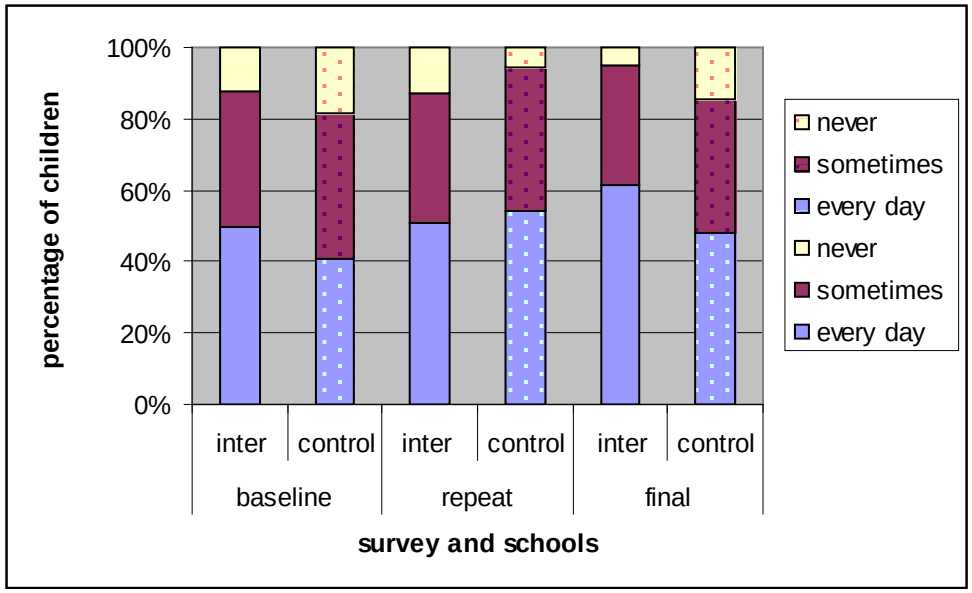
Differences between thin/healthy children and overweight/obese children were seen in the intervention schools, with fewer overweight/obese children not eating (9.3%, n =4

compared to 30.6%, n =30) and more sometimes eating a morning snack (60.5%, n=26 compared to 33.7%, n =33) ($p<0.004$).

#### 5.3.2.1.1 Mid-morning drinks

Significant differences were observed in whether children drank water at the morning break within schools in both intervention ($p<0.025$) and control schools ($p<0.012$) with an increase observed in all schools. In the final survey a significantly higher proportion of children in the intervention schools drank water (61.7%) compared to 48.2% in the control schools ($p<0.007$) (Figure 30).

**Fig 30 Frequency of children who drank water at morning break in intervention and control schools in the baseline, repeat and final surveys.**

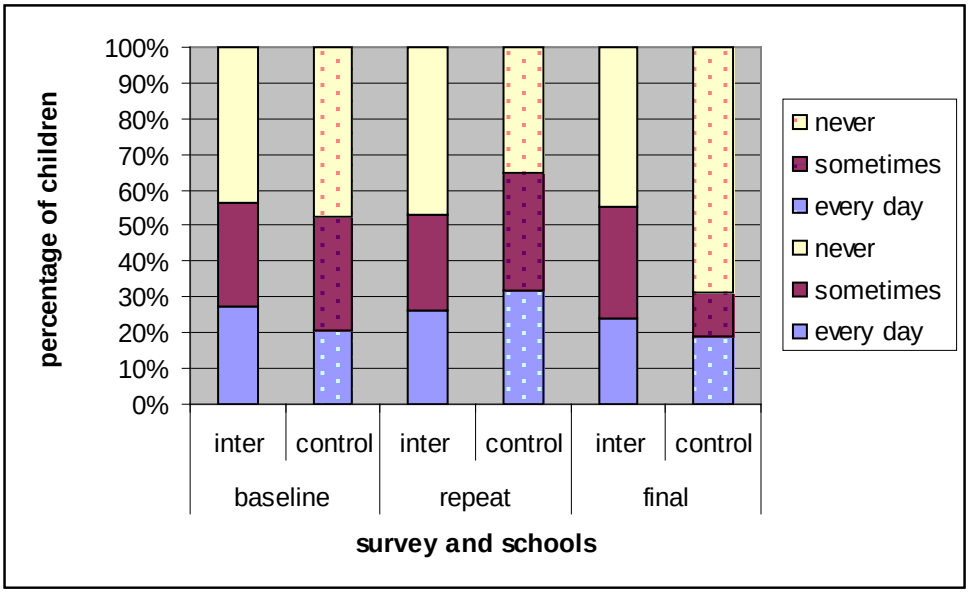



Final survey $X^2$ =10.031; df = 2; p<0.007
Intervention schools $X^2$ =11.145; df = 4; p<0.025  Control schools $X^2$ =12.814; df = 4; p<0.012

The choice of fruit juice at morning break varied between schools, a quarter of children in intervention schools drank juice everyday and this did not vary with time. In the final survey fruit juice was less popular in the control schools with a large reduction seen in the

percentages drinking it every day and sometimes (p<001), the reduction being significant compared to the intervention schools (p<0.001) in the final survey (Figure 3).1

**Fig 31 Frequency of children who drank fruit juice at morning break in intervention and control schools in the baseline, repeat and final surveys.**

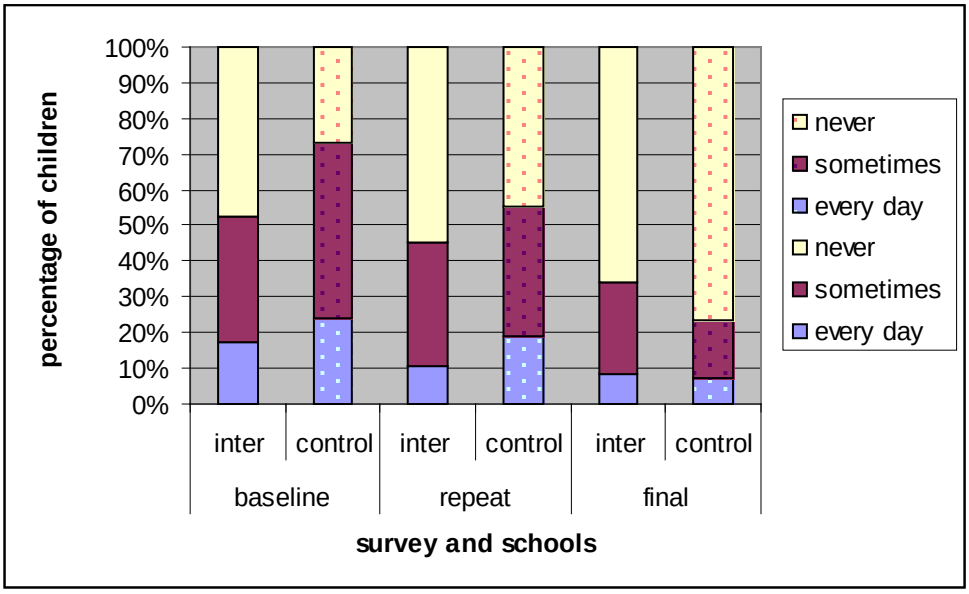



Final survey $X^2$ =17.584; df = 2; p<0.001  Control schools $X^2$ =28.651; df = 4; p<0.001

### 5.3.2.1.2 Mid-morning snacks

Intake of crisps was the only food to differ between and within schools. A reduction in intake was observed in all schools (intervention p<0.006, control p<0.001). The percentage that chose crisps every day decreased from an initial 17.3% to a final 8.2% in the intervention schools. In the control schools baseline values were significantly higher for children who always or sometimes ate crisps compared to the intervention schools (p<0.001) (Figure 32).

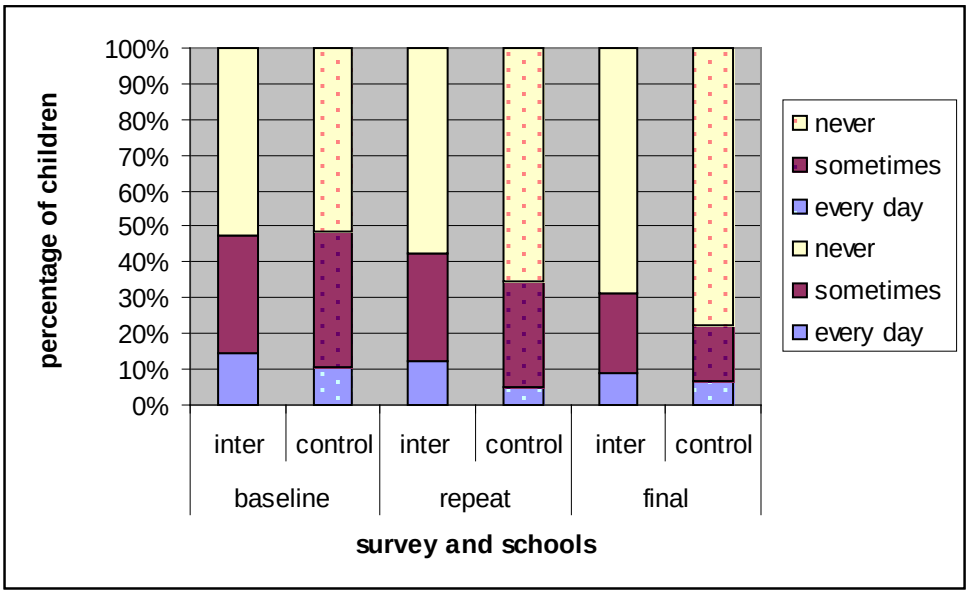
**Fig 32 Frequency of consumption of crisps at morning break, in intervention and control schools in the baseline, repeat and final surveys.**




Baseline survey $X^2$ =21.827; df = 2; p<0.001
Intervention schools $X^2$ =14.614; df = 4; p<0.006  Control schools $X^2$ =73.382; df = 4; p<0.001

The choice of chocolate and sweets as snacks became less popular between surveys and this was also observed in all schools. In the intervention schools two thirds of children never ate chocolate in the final survey compared to just over a half at baseline (p<0.037), a similar result was also seen in the control schools with over three quarters of children never eating chocolate in the final survey (p<0.001), Figure 33.

**Fig 33 Frequency of consumption of chocolate at morning break in intervention and control schools in the baseline, repeat and final surveys**



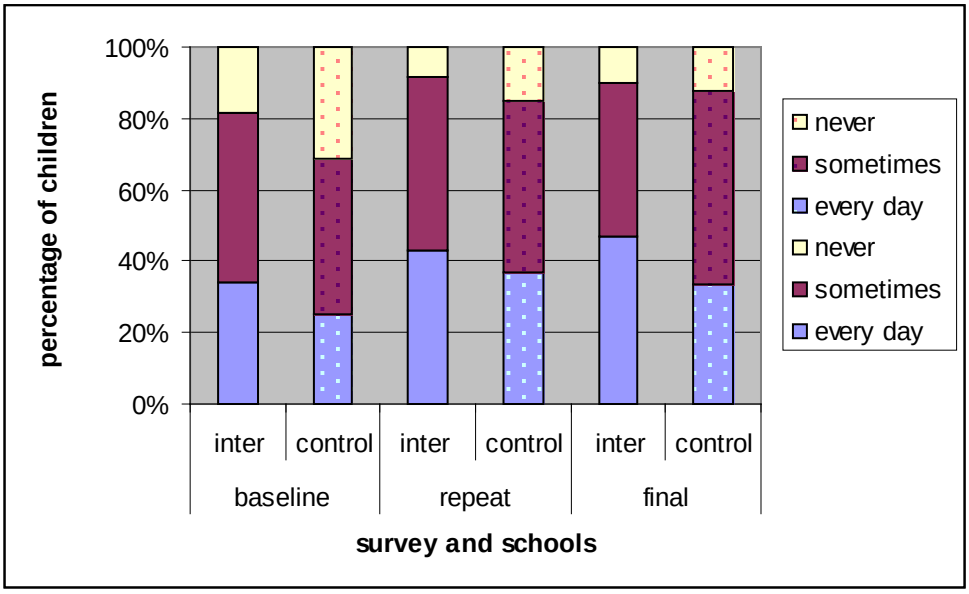

Intervention schools $X^2$ =10.182; df = 4; p<0.037  Control schools $X^2$ =22.455; df = 4; p<0.001

Sweet intake decreased in all schools across all surveys but this difference only reached significance in the control schools (p<0.039).

The choice of fruit as a morning snack increased in all schools. The percentage of children who ate fruit every day increased in the intervention schools from a third at baseline to nearly a half in the final survey (p<0.009). A higher proportion of children ate fruit in the intervention schools in all surveys but the difference between schools only reached significance in the baseline survey (p<0.003).

In the control schools an increase was also seen between surveys from a quarter at baseline to a third of children eating fruit every morning in the final survey (p<0.001), Figure 34.

**Fig 34 Frequency of consumption of fruit at morning break in intervention and control schools in the baseline, repeat and final surveys.**




Baseline survey $X^2$ =11.453; df = 2; p<0.003
Intervention schools $X^2$ =13.471; df = 4; p<0.009 Control schools $X^2$ =22.188; df = 4; p<0.001

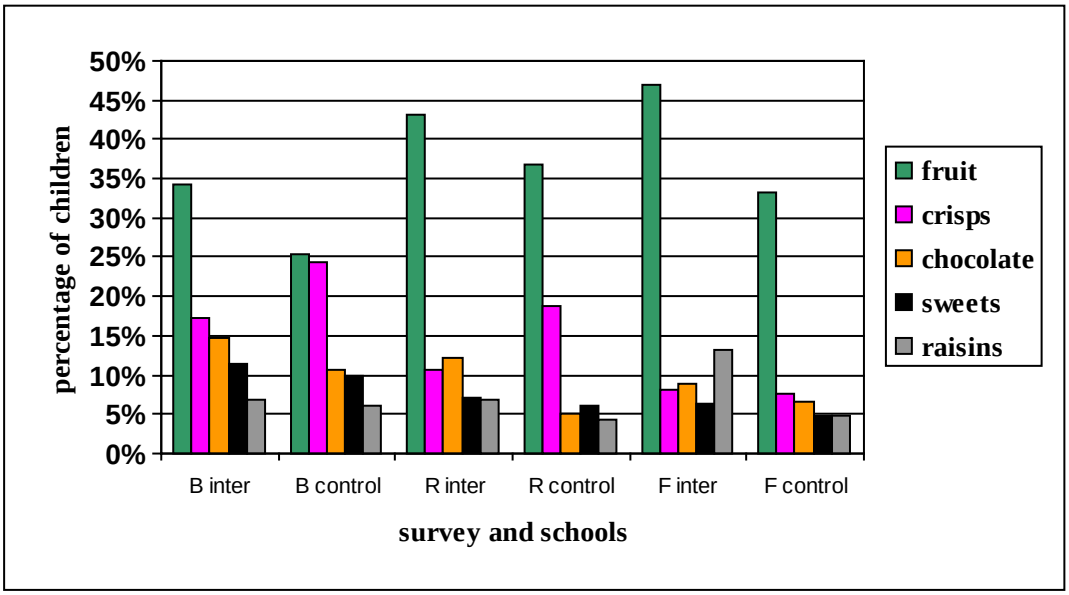
Significant differences were observed between boys and girls in the choice of fruit as a morning snack. In the baseline survey fewer boys ate fruit compared to girls (p<0.019 intervention schools, p<0.007 control schools).

In the repeat survey the percentage of both boys and girls who ate fruit had increased in the intervention schools so that values were similar, 41.3% (n =26) boys compared to 45.5% (n =30) girls. Whereas in the control schools even though an increase was seen in the percentages of both boys (28.3%, n =13) and girls (43.3%, n =29) who ate fruit the difference between the genders still remained but did not reach significant levels (p<0.057). In the final survey approximately equal numbers of boys and girls ate fruit.

The popularity of raisins as a morning snack increased in the intervention schools between surveys (p<0.011) but no change was observed in the control schools.

The changes observed in the choice of snacks for morning break are shown graphically in Figure 35.

**Fig 35 A comparison of the proportion of children choosing types of snacks food every day for morning break, in intervention and control schools in the baseline (B), repeat (R) and final (F) surveys.**




### 5.3.2.2 Afternoon snack

Between half and two thirds of all children surveyed always included an afternoon snack with fewer than 13.4% never having something to eat in the afternoon (Table 37). No significant differences were observed between schools but in the control schools children were more likely to eat snacks in the final survey (P<0.001).

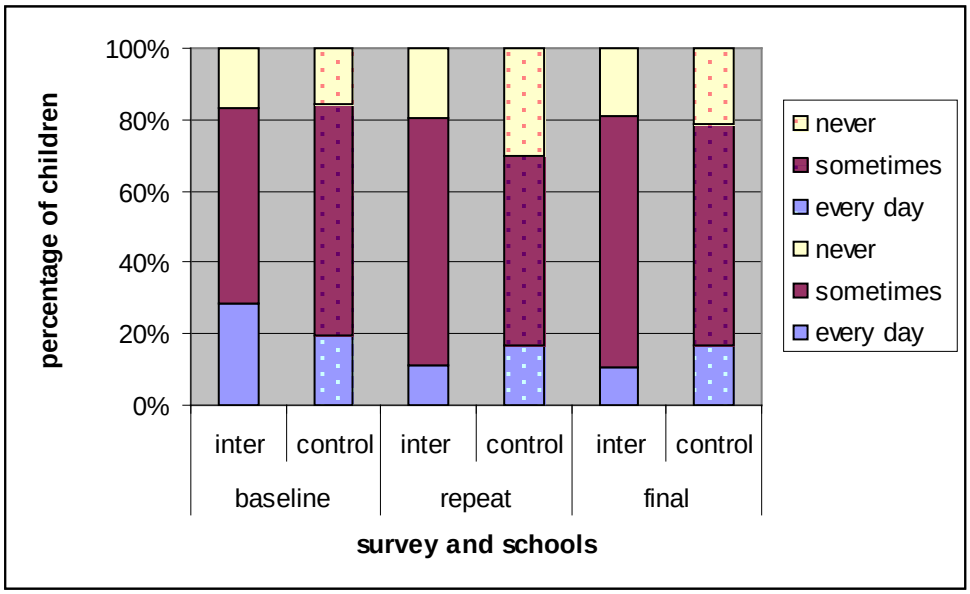
**Table 37 A comparison of the proportion of children eating a snack in the afternoon in intervention and control schools in the baseline, repeat and final surveys.**

| | | Intervention | | | Control | | | P value |
|---|---|---|---|---|---|---|---|---|
| | | **Baseline** | **Repeat** | **Final** | **Baseline** | **Repeat** | **Final** | |
| | | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | |
| | | | | | | | | |
| afternoon snack included | Yes | **66.2** (198) | **57.4** (93) | **57.3** (150) | **57.4** (191) | **48.2** (66) | **59.0** (75) | |
| | No | **5.7** (17) | **6.8** (11) | **6.9** (18) | **6.0** (20) | **13.1** (18) | **13.4** (17)* | 0.011 C |
| | Sometimes | **28.1** (84) | **35.8** (58) | **35.8** (94) | **36.6** (122) | **38.7** (53) | **27.6** (35) | |
| | Total | **100.0**(299) | **100.0**(162) | **100.0**(262) | **100.0**(333) | **100.0**(137) | **100.0**(127) | |

C-Control schools $X^2$=13.002; df = 4; p<0.011

Differences were observed in the popularity of chocolate ($p<0.007$) as an afternoon snack between and within schools. In the intervention schools a reduction in chocolate eating was seen between surveys with the percentage including chocolate every day decreasing from 28.4 to 10.8% in the final survey ($p<0.001$). Differences were also seen between schools at the baseline ($p<0.048$) and repeat surveys ($p<0.045$) with a higher percentage eating chocolate in the intervention schools at baseline and in the control schools in the repeat survey (Figure 36).

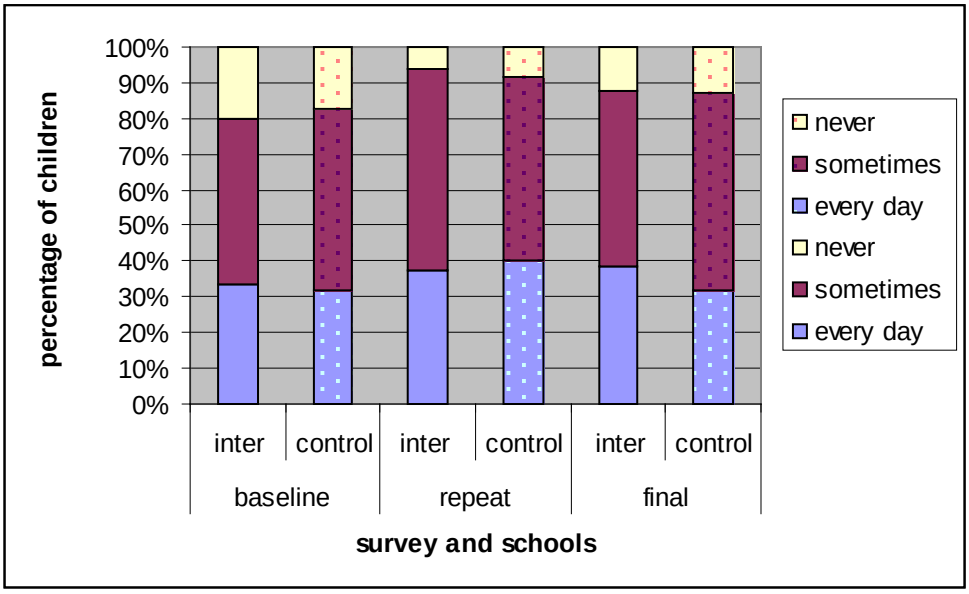
**Fig 36 Frequency of consumption of chocolate as a snack in the afternoon in intervention and control schools in the baseline, repeat and final surveys.**




Baseline survey $X^2=6.094$; df = 2; $p<0.048$ Repeat survey $X^2=6.189$; df = 2; $p<0.045$
Intervention schools $X^2=27.716$; df = 4; $p<0.001$

Fruit remained the most popular afternoon snack in all surveys, in the intervention schools the percentage always or sometimes choosing fruit increased from baseline values so that few children never ate fruit in the repeat survey and values remained above baseline in the final survey ($p<0.006$). In the control schools an increase in fruit intake was also observed in the repeat survey but these changes did not reach significant levels, Figure 37.

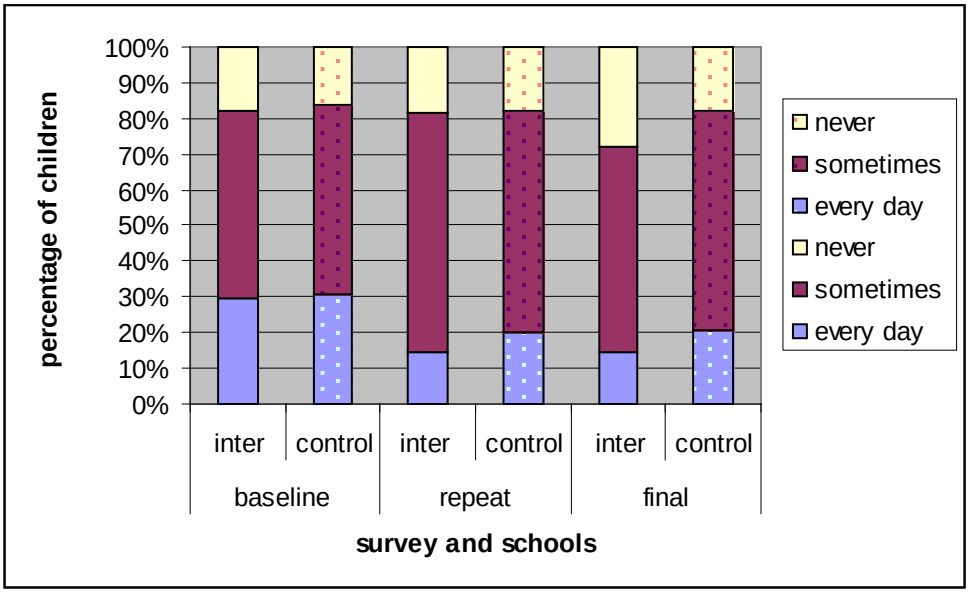
**Fig 37 Frequency of consumption of fruit as a snack in the afternoon in intervention and control schools in the baseline, repeat and final surveys.**




Intervention schools $X^2$ =14.460; df =4; p<0.006

Crisps became less popular as an afternoon snack with a reduction seen in all schools in the repeat survey and this reduction was sustained in the final survey (Figure 38), but the changes only reaching significance in the intervention schools (p<0.001). No significant differences were observed between schools.

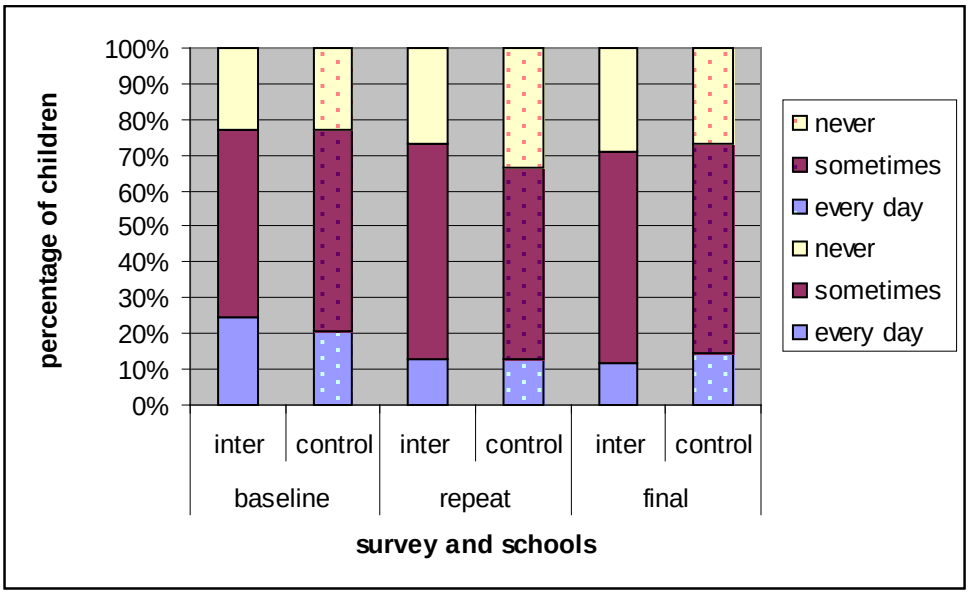
**Fig 38 Frequency of consumption of crisps as a snack in the afternoon in intervention and control schools in the baseline, repeat and final surveys.**




Intervention schools $X^2$ =22.984; df = 4; p<0.001

Sweets were chosen by a smaller percentage of children in the repeat and final survey in all schools (Figure 39) but the reduction only reached significance in the intervention schools where the intake of sweets in the afternoon halved from baseline values (p<0.007).

**Fig 39 Frequency of consumption of sweets as a snack in the afternoon in intervention and control schools in the baseline, repeat and final surveys.**

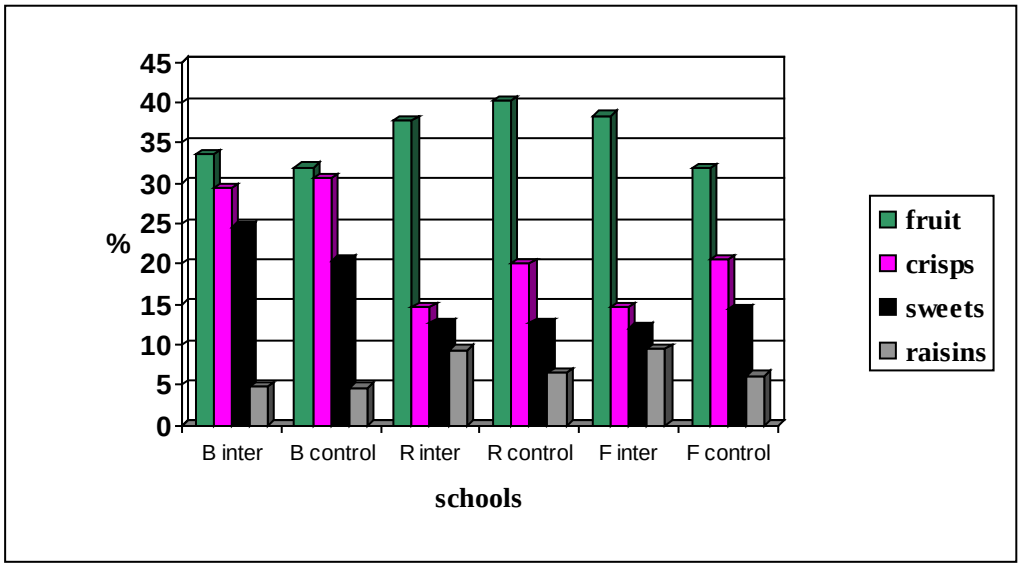



Intervention schools $X^2 = 14.147$; df = 4; $p<0.007$

Raisins were the least popular choice for afternoon snack in all surveys; the percentage increased in all schools but was greater in the intervention schools where intake doubled from 4.7 to 9.5% ($p<0.041$).

The significant changes observed in the choice of afternoon snacks in the intervention schools compared to the control schools are shown graphically in Figure 40.

**Fig 40 Comparison of foods chosen every day as afternoon snacks between intervention and control schools in the baseline (B), repeat (R) and final (F) surveys.**



### 5.3.2.3 Bedtime snacks

In the baseline survey around half of the children always ate a snack at bedtime. In the intervention school children were less likely to always eat a snack in the final survey compared to the control schools ($p<0.004$). In the control schools a significant difference was observed between surveys with more children always eating a bedtime snack in the final survey ($p<0.035$) (Table 38).

**Table 38 A comparison of the proportion of children eating a snack at bedtime in intervention and control schools in the baseline, repeat and final surveys.**

| | | Intervention | | | Control | | | P value |
|---|---|---|---|---|---|---|---|---|
| | | **Baseline** | **Repeat** | **Final** | **Baseline** | **Repeat** | **Final** | |
| | | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | |
| Eating a bedtime snack | | | | | | | | |
| | Yes | **50.9** (147) | **47.7** (73) | **42.4**(107)* | **44.3** (144) | **44.2** (57) | **59.6** (75)* | <0.004 F <0.035 C |
| | No | **10.0** (29) | **12.4** (19) | **17.1** (43) | **11.4** (37) | **14.7** (19) | **8.7** (11) | |
| | Sometimes | **39.1** (113) | **39.9** (61) | **40.5** (102) | **44.3** (144) | **41.1** (53) | **31.7** (40) | |
| | Total | **100.0**(289) | **100.0**(153) | **100.0**(252) | **100.0**(325) | **100.0**(129) | **100.0**(126) | |

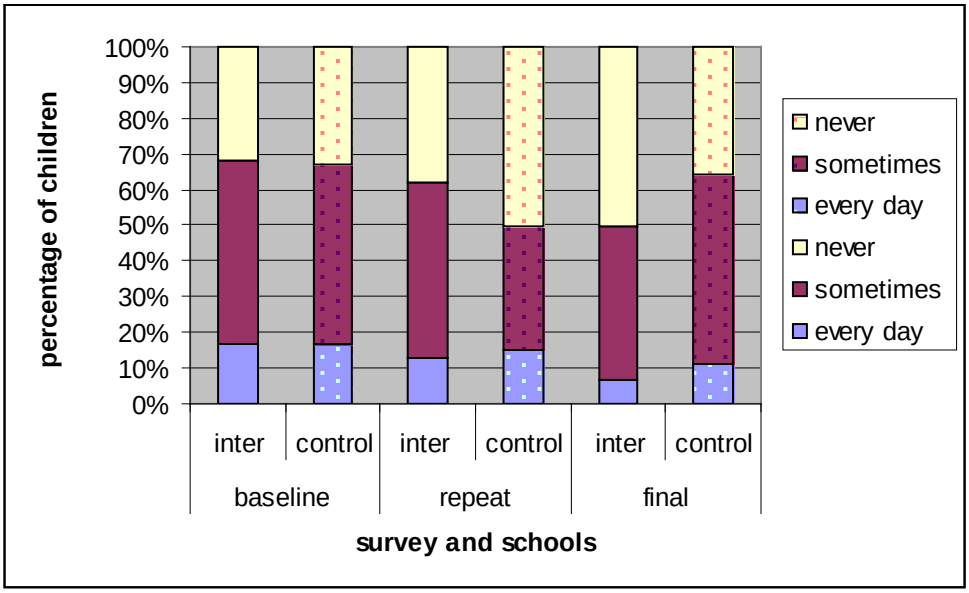
F-Final survey *$X^2$ =10.867; df = 2; p<0.004 *C-Control schools $X^2$ =10.333; df = 4; p<0.035

In the baseline survey thin/healthy children were more likely to eat a bedtime snack compared to overweight/obese children. In the control schools this difference between BMI classification was also seen in the repeat survey with 56.6% (n =47) thin/healthy children eating a bedtime snack compared to 20.5% (n = 9) of overweight/obese children, ($p<0.001$) whereas values were comparable in the intervention schools (47.3%, n = 43 compared to 41.0%, n =16).

Intake of crisps as a bedtime snack varied within schools over time. In the intervention schools a reduction was observed in the percentage of children who always ate crisps and an increase in those that never ate crisps between surveys ($p<0.001$). In the final survey nearly half never ate crisps at bedtime and only 7% included them everyday.

In the control schools a small reduction was also seen between surveys in those that always ate crisps at bedtime but the increase in those that never included crisps seen at the repeat survey was not sustained in the final survey ($p<0.026$) (Figure 41).

**Fig 41 Frequency of consumption of crisps as a snack at bedtime in intervention and control schools in the baseline, repeat and final surveys.**

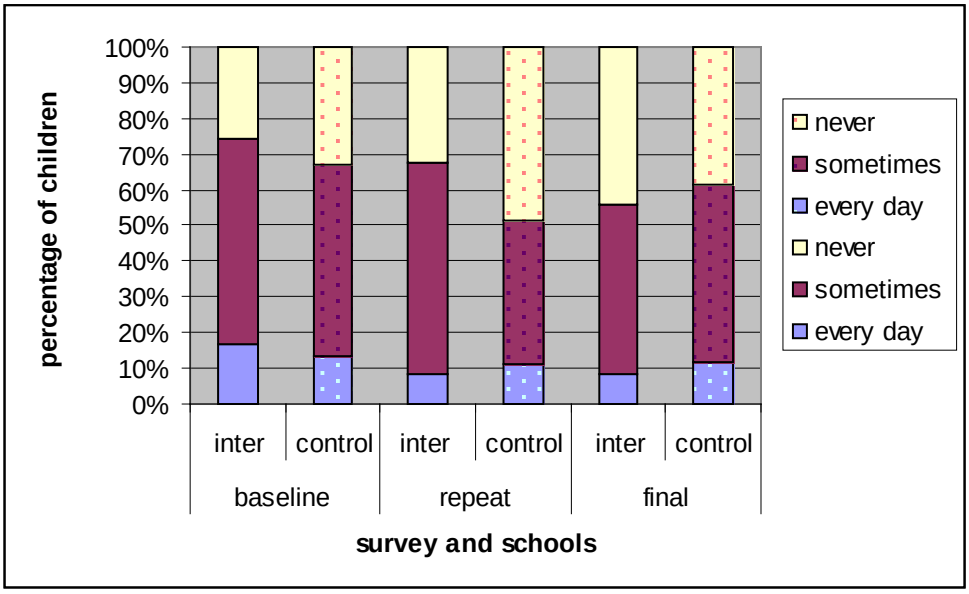



Intervention schools $X^2=17.878$; df = 4; $p<0.001$ Control schools $X^2=11.055$; df = 4; $p<0.026$

Overweight/obese children were less likely to eat crisps at bedtime but this only reached significance in the intervention schools in the repeat survey with no overweight/obese child reporting to eat crisps every night compared to 19.7% (n =12) of thin/healthy children ($p<0.046$).

A significant difference was observed within the intervention schools ($p<0.001$) with the proportion of children who always ate chocolate at bedtime decreasing by half in the repeat survey, which was sustained in the final survey. Also the percentage that never ate chocolate increased from a quarter to nearly half of the children in the final survey. These changes reached significance between schools in the repeat survey ($p<0.025$), (Figure 42).

**Fig 42 Frequency of consumption of chocolate as a snack at bedtime in the baseline, repeat and final surveys in intervention and control schools.**

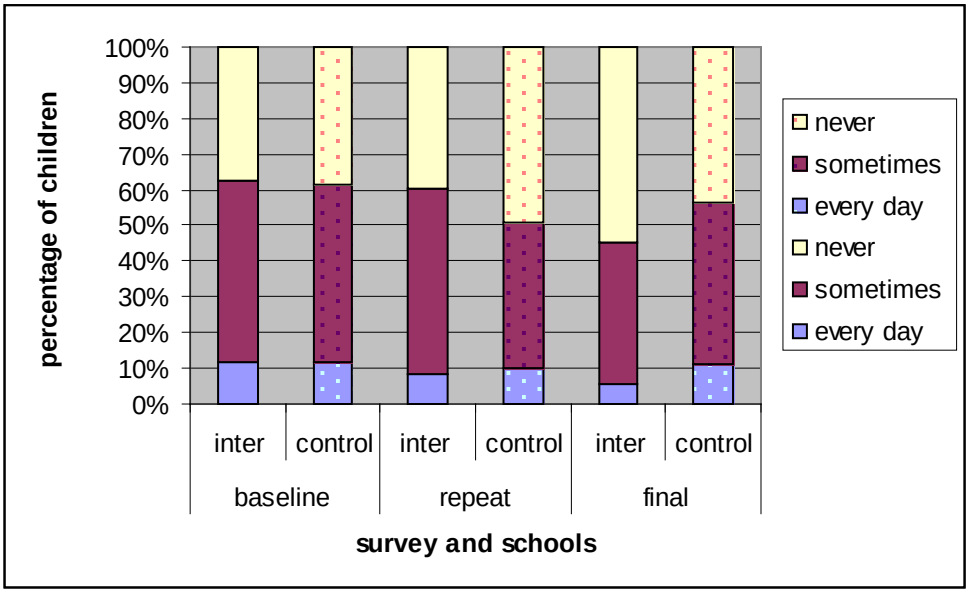



Repeat survey $X^2$ =7.397; df = 2; p<0.025  Intervention schools $X^2$ =19.838; df = 4; p<0.001

A difference in the consumption of chocolate was also seen between thin/healthy and overweight/obese children, with more thin/healthy children eating chocolate than overweight/obese children. These differences were seen in the repeat surveys in both the intervention schools (11.7%, n =7 compared to 0%, p<0.006) and in the control schools (15.4%, n =10 compared to 0%, p<0.047).

In the intervention schools the popularity of sweets as a bedtime snack decreased over time (p<0.008), no significant change was observed in the control schools (Figure 43).

**Fig 43 Frequency of consumption of sweets as a snack at bedtime in the baseline, repeat and final surveys in intervention and control schools.**




Intervention schools $X^2$ =13.711; df = 4; p<0.008

### 5.3.3 Drinks

The percentage of children that included fizzy drink on a daily basis decreased in all schools in the repeat survey. A further decrease was seen in the intervention schools in the final survey but not in the control schools which remained stable. These changes reached significance in both types of schools (p<0.001 Intervention schools, p<0.011 Control schools). (Table 39).

**Table 39 Frequency of consumption of fizzy drinks in intervention and control schools in the baseline, repeat and final surveys.**

| | | Intervention | | | Control | | | P value |
|---|---|---|---|---|---|---|---|---|
| | **Daily** | **Baseline** | **Repeat** | **Final** | **Baseline** | **Repeat** | **Final** | |
| | | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | |
| Consume Fizzy drinks | Yes | **41.4** (126) | **29.9** (50) | **22.5** (60) | **38.2** (128) | **26.9** (39) | **26.6** (34) | <0.001 I <0.011 C |

A summary of the significant differences observed in children's eating habits during the study period are provided in table 40. The data is presented for differences observed

between schools and also within schools over time. The information indicates whether there was an increase or decrease in food choice and also if the differences occurred at B (baseline survey), R (repeat survey) or F (final survey) or within I (intervention schools) or C (control schools).

**Table 40 A summary of the differences observed in children's eating habits between Intervention and Control schools at each survey round and within Intervention and Control schools across surveys**

| **Meal** | **Differences observed between schools at each survey round** | **Differences observed in schools across survey rounds** |
|---|---|---|
| **Breakfast** | | |
| Who chooses meal | ↑Parents **I (B) (R)** | |
| Where eaten | Home ↑**I** (**B)** | Home ↑**I** |
| What eaten | Yoghurt ↑**I** (**B)** | Fruit ↑ **C**<br>Chocolate ↓**I**<br>Crisps ↓**I** |
| Drink | Fruit juice ↓**C** (**F**) | Fizzy drink ↓**I+C**<br>Fruit juice ↓**C** |
| **Lunch** | | |
| Eating habits | Pack lunch ↓**C** (**B**) | |
| Pack lunch | Yoghurt ↑**C** (**B**)<br>Something else ↑**I (B)** | Yoghurt ↑**I**<br>Biscuit ↓**I**<br>Fruit ↑**I+C** |
| School dinner | Salad ↑**I** (**F**) | Bread ↑**I+C**<br>Vegetables ↑**I**+**C** |
| **Evening meal** | | |
| Who chooses meal | | ↓parents **I** |
| What eaten | Vegetables ↑**I (R)** | Chips ↓**I+C**<br>Veg ↑**I** |
| **Snacks** | | |
| **morning** | How many eat snack ↓**C (F)** | |
| Drinks | Milk ↓**C (B)**<br>Water ↑**I (F)**<br>Fruit juice ↓**C (F)** | Water ↑**I+C**<br>Fruit juice ↓**C** |
| Food eaten | Crisps ↑**C (B)**<br>Fruit ↑**I (B)**<br>Yoghurt ↑**I (B)** | Crisps ↓**I+C**<br>Chocolate ↓**I+C**<br>Sweets ↓**C**<br>Fruit ↑**I+C**<br>Raisins ↑**I** |

| | | |
|---|---|---|
| **afternoon** | | How many eat snack ↓**C** |
| Food eaten | Chocolate ↑**I (B)**<br>Chocolate ↑**C (R)** | Fruit ↑**I**<br>Crisps ↓**I**<br>Chocolate ↓**I**<br>Sweets ↓**I**<br>Raisins ↑**I** |
| **bedtime** | How many eat snack ↑**C (F)** | How many eat snack ↑**C** |
| Food eaten | Chocolate ↓**I (R)** | Crisps ↓**I+C**<br>Chocolate ↓**I**<br>Sweets ↓**I** |
| **Drinks** | | Fizzy drink ↓**I+C** |

### 5.3.4 Intake of targeted food

The intake of some foods that were targeted in the intervention were studied in greater detail. These were fruit intake and two high fat foods (namely crisps and chocolate) as these foods could be eaten either part of a packed lunch, breakfast or as snacks.

#### 5.3.4.1 Fruit intake

The fruit intake of children was assessed in several ways;

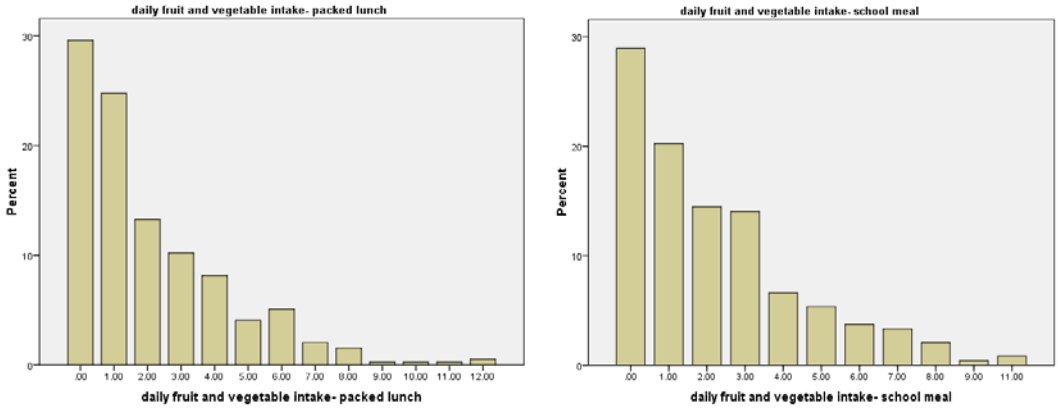
- looking at fruit intake at specific meals or snacks (details in results, sections and )
- daily fruit (and vegetable) intake -counting how many times fruit and vegetables were chosen by children in the questionnaire, (children had between 12 and 13 opportunities to choose fruit and vegetables when answering the questionnaire)
- response to question on how often they ate fruit.

##### 5.3.4.1.1 Daily fruit intake

There were 12 or 13 opportunities per day to choose fruit and vegetables in the questionnaire depending on whether children consumed a packed lunch or the school meal. From these opportunities 20-25% of children indicated they ate 1 portion, 13-14.5%

2 portions and 10-14% 3 portions a day with nearly 30% not choosing any fruit or vegetables, as shown in Figure 44.

**Fig 44 Daily fruit and vegetable intake of all children at baseline – packed lunch and school meal.**




From the opportunities to choose fruit and vegetables the overall mean daily intake of fruit and vegetables at baseline was 2.06 for children eating a packed lunch and 2.19 for children eating a school meal. Mean daily fruit and vegetable intake for children who chose the school meal was higher in the intervention schools at baseline 2.45 compared to 2.07 in the control schools and this was consistent throughout the surveys. In the repeat survey the mean daily fruit and vegetable intake was higher in all schools whichever type of lunch was chosen. In the final survey it decreased in all apart from children who chose the packed lunch in the intervention schools but values remained above baseline values in all schools (Tables 41 and 42).

**Table 41 Comparison of Mean daily fruit and vegetable intake (packed lunch) in intervention and control schools in the baseline, repeat and final surveys.**

| Survey | Intervention | | | Control | | |
|---|---|---|---|---|---|---|
| | Mean | N | Std deviation | Mean | N | Std deviation |
| Baseline | 2.05 | 202 | 2.36 | 2.07 | 190 | 2.16 |
| Repeat | 2.45 | 117 | 2.02 | 2.57 | 97 | 1.94 |
| Final | 2.45 | 186 | 2.23 | 2.24 | 86 | 2.30 |
| Total | | 505 | | | 373 | |

(NB: mean intake derived from 12 opportunities to include fruit or vegetables in questionnaire)

**Table 42 Comparison of Mean daily fruit and vegetable intake (school meal) in intervention and control schools in the baseline, repeat and final surveys.**

| Survey | Intervention | | | Control | | |
|---|---|---|---|---|---|---|
| | Mean | N | Std deviation | Mean | N | Std deviation |
| Baseline | 2.49 | 98 | 2.38 | 1.99 | 144 | 2.22 |
| Repeat | 3.21 | 48 | 3.33 | 2.98 | 45 | 2.64 |
| Final | 2.98 | 80 | 2.76 | 2.66 | 44 | 2.44 |
| Total | | 226 | | | 233 | |

(NB: mean intake derived from 13 opportunities to include fruit or vegetables in questionnaire)

For children who chose a packed lunch a trend was observed that the mean daily fruit and vegetable intake was higher in girls (apart from the control group in the final survey) compared to the boys. The mean values increased for both boys and girls in the repeat survey and remained above baseline values in the final survey (Table 43).

**Table 43 Comparison of mean daily fruit and vegetable intake (packed lunch) of boys and girls in intervention and control schools in the baseline, repeat and final surveys.**

| Survey | | Intervention | | | Control | | |
|---|---|---|---|---|---|---|---|
| | | Mean | N | Std deviation | Mean | N | Std deviation |
| Baseline | Boys | 1.41 | 105 | 1.98 | 1.11 | 101 | 1.62 |
| | Girls | 1.98 | 96 | 2.04 | 2.19 | 89 | 1.86 |
| Repeat | Boys | 1.89 | 56 | 1.70 | 1.71 | 41 | 1.71 |
| | Girls | 1.98 | 60 | 1.74 | 2.24 | 54 | 1.71 |
| Final | Boys | 1.71 | 104 | 1.85 | 2.08 | 39 | 2.29 |
| | Girls | 2.28 | 79 | 1.97 | 1.45 | 47 | 1.74 |

(NB: mean intake derived from 12 opportunities to include fruit or vegetables in questionnaire)

Similarly for children who chose the school meal the mean daily fruit and vegetable intake was higher in girls (apart from the control group in the repeat survey) compared to the boys. Mean values increased in the repeat survey for both boys and girls and again remained above baseline values in the final survey (Table 44).

**Table 44 Comparison of mean daily fruit and vegetable intake (school meal) of boys and girls in intervention and control schools in the baseline, repeat and final surveys.**

| Survey | | Intervention | | | Control | | |
|---|---|---|---|---|---|---|---|
| | | Mean | N | Std deviation | Mean | N | Std deviation |
| Baseline | Boys | 1.93 | 44 | 2.14 | 1.80 | 79 | 2.13 |
| | Girls | 2.87 | 53 | 2.45 | 2.20 | 64 | 2.32 |
| Repeat | Boys | 3.00 | 25 | 3.63 | 3.52 | 21 | 3.01 |
| | Girls | 3.44 | 23 | 3.04 | 2.50 | 24 | 2.23 |
| Final | Boys | 2.85 | 34 | 2.75 | 2.24 | 21 | 2.53 |
| | Girls | 3.07 | 46 | 2.78 | 3.04 | 23 | 2.34 |

(mean intake derived from 13 opportunities to include fruit or vegetables in questionnaire)

The discrepancy in the total numbers of children in this section is due to a small number of children not indicating their gender on the questionnaire.

### 5.3.4.1.2 Children's reported frequency of fruit intake

Children were asked to indicate how often they ate fruit with responses from every day to never. The percentage of children who reported eating fruit every day increased in all schools in both the repeat and final surveys with a significantly larger increase observed in the intervention schools ($p<0.001$ I, $p<0.033$ C)). About half of all children reported eating fruit every day in the repeat survey and this increase was sustained in the intervention schools for the final survey but had decreased in the control schools. The change in fruit intake was mainly due to a reduction in those eating fruit only on some days or hardly ever (Table 45).

**Table 45 Comparison of children's reported fruit intake in intervention and control schools in the baseline, repeat and final surveys.**

| | | **Intervention** | | | **Control** | | | P value |
|---|---|---|---|---|---|---|---|---|
| | | **Baseline** | **Repeat** | **Final** | **Baseline** | **Repeat** | **Final** | |
| | | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | |
| | | | | | | | | |
| Frequency of fruit intake | Every day | **34.0** (103) | **50.3** (84) | **47.7**(127)* | **35.0** (117) | **46.9** (68) | **40.6** (52) | <0.001 I <0.033 C |
| | Most days | **30.7** (93) | **31.7** (53) | **31.8** (85) | **30.5** (102) | **31.7** (46) | **33.6** (43) | |
| | Some days | **25.4** (77) | **12.6** (21) | **17.6** (47) | **24.0** (80) | **17.2** (25) | **21.9** (28) | |
| | Hardly ever | **6.9** (21) | **4.8** (8) | **2.2** (6) | **8.4** (28) | **2.1** (3) | **3.9** (5)** | |
| | Never | **3.0 (**9) | **0.6** (1) | **0.7** (2) | **2.1** (7) | **2.1** (3) | **0.0** (0) | |
| | Total | **100.0**(303) | **100.0**(167) | **100.0**(267) | **100.0**(334) | **100.0**(145) | **100.0**(128) | |

Intervention schools $X^2=31.401$; df = 8; $p<0.001$ Control schools $X^2=16.697$; df = 8; $p<0.033$

To confirm whether reported fruit intake of children had changed between surveys the mean of frequency of fruit intake was obtained by scoring the categories from eating fruit every day (having a value of 5) to never eating fruit (having a value of 1). An increase in mean value indicating that frequency of intake had increased. The mean increased in all schools in the repeat survey with a greater increase observed in the intervention schools, and was also higher in the intervention schools in the final survey. This indicating that children ate fruit more often (Table 46).

**Table 46 Comparison of Mean frequency of fruit intake in intervention and control schools in the baseline, repeat and final surveys.**

| Survey | Intervention | | | Control | | |
|---|---|---|---|---|---|---|
| | Mean | N | Std deviation | Mean | N | Std deviation |
| Baseline | 3.86 | 303 | 1.06 | 3.88 | 334 | 1.05 |
| Repeat | 4.26 | 167 | 0.90 | 4.19 | 145 | 0.94 |
| Final | 4.23 | 267 | 0.87 | 4.11 | 128 | 0.88 |
| Total | 4.09 | 737 | 0.98 | 4.00 | 607 | 0.99 |

When the mean frequency of fruit intake was compared between boys and girls a trend was identified with the mean being higher in girls in all surveys (apart from the control group in the repeat survey) indicating that girls eat fruit more often than boys. The mean increased from baseline values for both boys and girls, indicating that frequency of fruit intake increased in both boys and girls (Table 47).

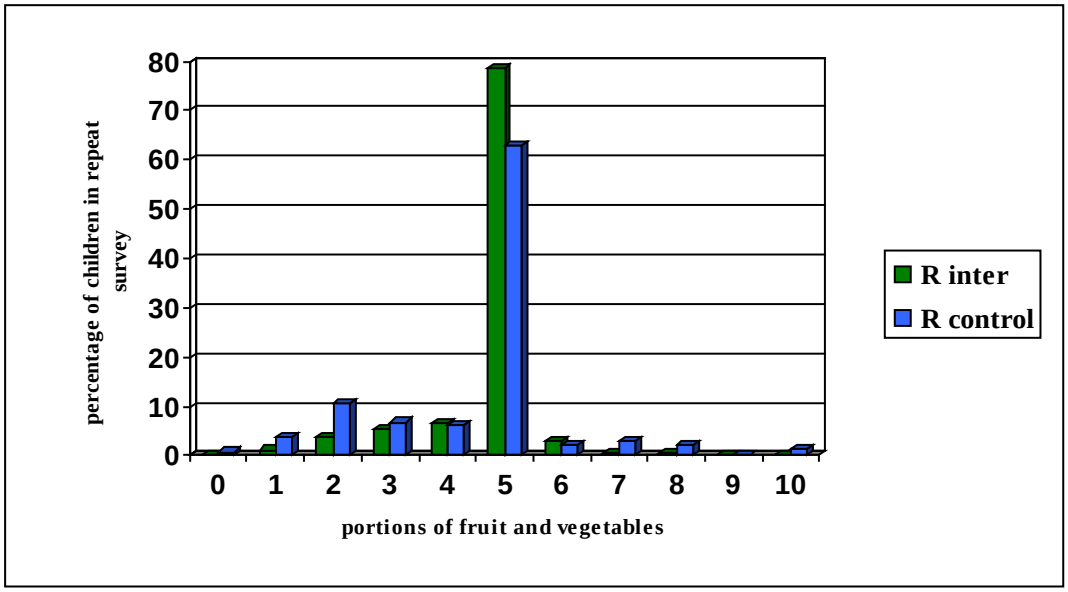
**Table 47 Comparison of mean frequency of fruit intake of boys and girls in intervention and control schools in the baseline, repeat and final surveys.**

| Survey | | Intervention | | | Control | | |
|---|---|---|---|---|---|---|---|
| | | Mean | N | Std deviation | Mean | N | Std deviation |
| Baseline | Boys | 3.79 | 148 | 1.10 | 3.72 | 181 | 1.10 |
| | Girls | 3.92 | 153 | 1.02 | 4.07 | 152 | 0.95 |
| Repeat | Boys | 4.15 | 82 | 1.02 | 4.23 | 65 | 0.95 |
| | Girls | 4.38 | 84 | 0.76 | 4.19 | 78 | 0.93 |
| Final | Boys | 4.20 | 137 | 0.88 | 3.98 | 58 | 0.91 |
| | Girls | 4.28 | 127 | 0.86 | 4.21 | 70 | 0.85 |

### 5.3.4.1.3 Assessing nutritional knowledge on recommended intake of fruit and vegetables

In the repeat and final surveys questions to assess the nutritional knowledge of the children were included and children were asked to provide the recommended number of portions of fruit and vegetables to include each day. Overall responses ranged from 0 to 20, with 73.5% providing the correct number and 7.3% suggesting a figure above 5 and 1.3% below 2. Details of the responses of children in the repeat survey are shown in Figure 45.

**Fig 45 Children's response to the question on how many portions of fruit and vegetables should be included each day in the repeat survey.**




A higher percentage of children in the intervention schools were able to provide the correct answer to the question in both surveys with 78.5 and 78.8% compared to 62.9 and 66.9% in the control schools. Full details are provided in appendix 4. Mean values for the number of portions to include were similar in both schools but a greater standard deviation was observed in the control schools (Table 48).

**Table 48 Comparison of Mean values of children's reply to how many portions of fruit and vegetables should be included each day in intervention and control schools in the repeat and final surveys.**

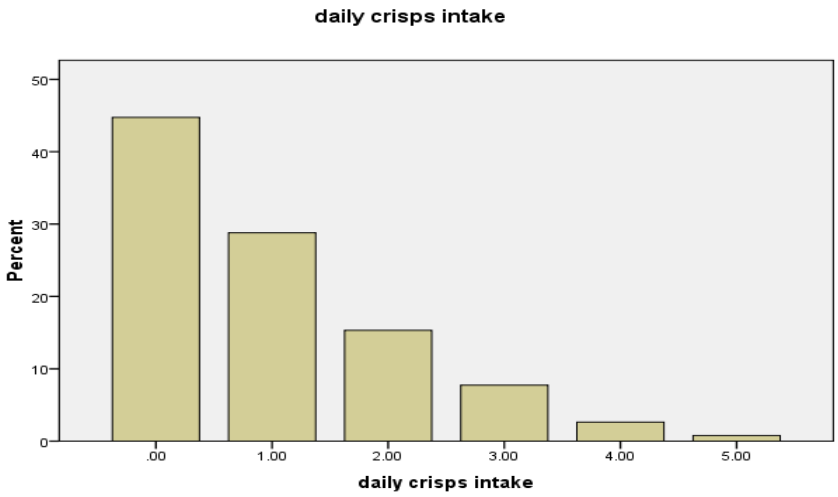
| Survey | Intervention | | | Control | | |
|---|---|---|---|---|---|---|
| | Mean | N | Std deviation | Mean | N | Std deviation |
| Repeat | 4.72 | 163 | 0.93 | 4.52 | 132 | 1.61 |
| Final | 4.86 | 255 | 1.11 | 4.88 | 121 | 2.05 |
| Total | 4.81 | 418 | 1.04 | 4.70 | 253 | 1.84 |

### 5.3.4.2 Intake of Crisps

The total intake of crisps in a day was calculated by counting how often crisps were chosen in the questionnaire by children, a total of 5 opportunities to choose crisps were available. It was assumed that children would eat one packet per opportunity. Overall

44.7% did not choose crisps every day, with the remaining choosing crisps from once a day (28.8%) to five times in a day (0.8%) (Figure 46).

**Fig 46 Daily crisps intake of all children as indicated by their response to all 5 questions containing crisps as an option in the questionnaire.**




A trend was observed in all schools with the percentage of children who never ate crisps or only eating crisps once a day increasing in the repeat and final surveys and those that included crisps 2 or 3 times per day decreasing (Table 49).

**Table 49 Comparison of frequency of children's crisps intake in intervention and control schools in the baseline, repeat and final surveys.**

| | | Intervention | | | Control | | | P value |
|---|---|---|---|---|---|---|---|---|
| | | **Baseline** | **Repeat** | **Final** | **Baseline** | **Repeat** | **Final** | |
| | | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | |
| | | | | | | | | |
| Frequency of crisps intake | 0 | **45.3** (139) | **49.1** (82) | **51.5** (140) | **44.2** (150) | **48.3** (70) | **49.2** (64) | |
| | 1 | **29.0** (89) | **35.9** (60) | **34.9** (95) | **28.6** (97) | **33.1** (48) | **35.4** (46) | Ns |
| | 2 | **13.4** (41) | **10.2** (17) | **8.8** (24) | **17.1** (58) | **9.0** (13) | **8.5** (11) | |
| | 3 | **8.1** (25) | **3.0** (5) | **3.3** (9) | **7.4** (25) | **5.5 (**8) | **4.6** (6) | |
| | 4 | **2.9 (**9) | **0.6** (1) | **1.1** (3) | **2.4** (8) | **3.4** (5) | **2.3** (3) | |
| | 5 | **1.3** (4) | **1.2** (2) | **0.4** (1) | **0.3** (1) | **0.7** (1) | **0.0** (0) | |
| | Total | **100.0**(307) | **100.0**(167) | **100.0**(272) | **100.0**(339) | **100.0**(145) | **100.0**(130) | |

When mean of frequency of crisp intake was compared between schools the mean value decreased in all schools in the repeat survey from baseline and a further decrease was

observed in the final survey. A larger reduction in mean daily crisps intake was observed in the intervention schools (Table 50).

**Table 50 Comparison of Mean daily crisps intake in intervention and control schools in the baseline, repeat and final surveys.**

| Survey | Intervention | | | Control | | |
|---|---|---|---|---|---|---|
| | Mean | N | Std deviation | Mean | N | Std deviation |
| Baseline | 0.98 | 307 | 1.18 | 0.96 | 339 | 1.08 |
| Repeat | 0.74 | 167 | 0.95 | 0.85 | 145 | 1.10 |
| Final | 0.69 | 272 | 0.89 | 0.75 | 130 | 0.96 |
| Total | 0.82 | 746 | 1.04 | 0.89 | 614 | 1.06 |

(NB: mean intake derived from 5 opportunities to include crisps in questionnaire)

A difference was observed in the mean values between boys and girls with the mean being higher in boys at baseline in all schools and the largest reduction in mean value between surveys observed in boys in the intervention schools (Table 51).

**Table 51 Comparison of mean daily crisps intake of boys and girls in intervention and control schools in the baseline, repeat and final surveys.**

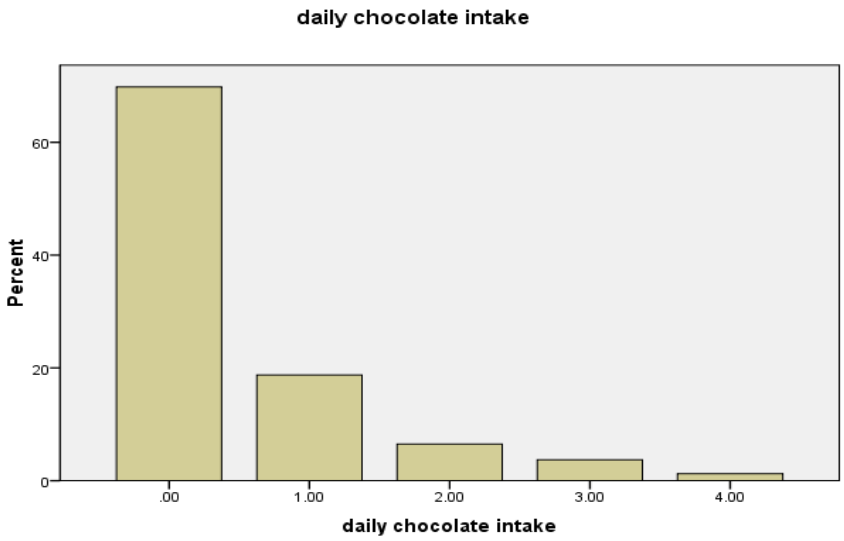
| Survey | | Intervention | | | Control | | |
|---|---|---|---|---|---|---|---|
| | | Mean | N | Std deviation | Mean | N | Std deviation |
| Baseline | Boys | 1.03 | 151 | 1.23 | 1.08 | 184 | 1.15 |
| | Girls | 0.95 | 154 | 1.13 | 0.83 | 154 | 0.98 |
| Repeat | Boys | 0.78 | 82 | 0.97 | 0.85 | 65 | 1.12 |
| | Girls | 0.70 | 84 | 0.93 | 0.81 | 78 | 1.03 |
| Final | Boys | 0.65 | 141 | 0.88 | 0.82 | 60 | 1.05 |
| | Girls | 0.72 | 127 | 0.92 | 0.70 | 70 | 0.87 |

(NB: mean intake derived from 5 opportunities to include crisps in questionnaire)

### 5.3.4.3 Chocolate intake

The total intake of chocolate in a day was calculated by counting how often chocolate was chosen in the questionnaire by children, a total of 4 opportunities to choose chocolate were available. It was assumed that children would eat 1 portion (equivalent to 1 standard bar) per opportunity. Overall 69.8% did not choose chocolate every day, with the remaining choosing chocolate from once a day (18.7%) to four times in a day (1.2%) (Figure 47).

**Fig 47 Daily chocolate intake of all children as indicated by their response to the 4 questions including chocolate as an option in the questionnaire.**




The mean value for daily chocolate intake was higher in the intervention schools at baseline and decreased in both the repeat and final surveys. In the control schools a reduction in mean values was observed in the repeat survey but this was not maintained in the final survey (Table 52).

**Table 52 Comparison of Mean daily chocolate intake in intervention and control schools in the baseline, repeat and final surveys.**

| Survey | Intervention | | | Control | | |
|---|---|---|---|---|---|---|
| | Mean | N | Std deviation | Mean | N | Std deviation |
| Baseline | 0.57 | 307 | 0.96 | 0.39 | 339 | 0.77 |
| Repeat | 0.28 | 167 | 0.69 | 0.28 | 145 | 0.69 |
| Final | 0.25 | 272 | 0.64 | 0.34 | 130 | 0.74 |
| Total | 0.39 | 746 | 0.81 | 0.35 | 614 | 0.75 |

(NB: mean intake derived from 4 opportunities to include chocolate in questionnaire)

When the mean daily chocolate intake was compared between boys and girls the mean value was higher in boys in all schools and in all surveys. A reduction in mean values was seen in both boys and girls in the intervention schools in all surveys but in the control schools a reduction in mean value was only observed in the repeat survey (Table 53).

**Table 53 Comparison of mean daily chocolate intake of boys and girls in intervention and control schools in the baseline, repeat and final surveys.**

| Survey | | Intervention | | | Control | | |
|---|---|---|---|---|---|---|---|
| | | Mean | N | Std deviation | Mean | N | Std deviation |
| Baseline | Boys | 0.64 | 151 | 1.02 | 0.43 | 184 | 0.82 |
| | Girls | 0.51 | 154 | 0.89 | 0.34 | 154 | 0.71 |
| Repeat | Boys | 0.33 | 82 | 0.70 | 0.35 | 65 | 0.82 |
| | Girls | 0.24 | 84 | 0.69 | 0.19 | 78 | 0.56 |
| Final | Boys | 0.27 | 141 | 0.71 | 0.50 | 60 | 0.89 |
| | Girls | 0.23 | 127 | 0.57 | 0.20 | 70 | 0.55 |

(NB: mean intake derived from 4 opportunities to include chocolate in questionnaire)

### 5.3.5 Control - Who influenced what children were eating at mealtimes

Children were provided with a list of options for who chose what was eaten at mealtimes (breakfast, packed lunch and evening meal); you (child), parent or someone else. Many children ticked more than one option at each meal and due to the small numbers for some combinations the answers were recoded into four categories; you (child), parent, you (child) and parent, other. These four categories were used for any analysis of the data for each meal.

Any differences between gender or BMI classifications were recorded together with any changes between surveys or types of schools.

This information provides useful indicators on whether children perceive they have any influence on food choice at mealtimes.

#### 5.3.5.1 Breakfast

Two thirds of children answered that they chose what was eaten at breakfast. In the baseline ($p<0.001$) and repeat ($p<0.003$) surveys a higher percentage of parents in the

intervention schools chose what was eaten at breakfast compared to the control schools (Table 54).

**Table 54 A comparison of who chose what was eaten at breakfast in intervention and control schools in the baseline, repeat and final surveys.**

| | | Intervention | | | Control | | | P value |
|---|---|---|---|---|---|---|---|---|
| | | **Baseline** | **Repeat** | **Final** | **Baseline** | **Repeat** | **Final** | |
| | | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | |
| | | | | | | | | |
| Who chose what was eaten for breakfast | Child | **66.9** (186) | **69.2** (108) | **70.2** (170) | **65.6** (202) | **76.1** (96) | **70.0** (84) | |
| | Parent | **27.4** (76) | **20.5** (32) | **21.5** (52) | **17.2** (53) | **15.9** (20) | **18.3** (22) | <0.001 B |
| | Child+parent | **4.3** (12)* | **10.3** (16) | **5.8** (14) | **14.9** (46)* | **3.2** (4) | **10.0** (12) | <0.003 R |
| | Other | **1.4** (4) | **0** (0)** | **2.5** (6) | **2.3** (7) | **4.8** (6)** | **1.7** (2) | |
| | Total | **100.0**(278) | **100.0**(156) | **100.0**(242) | **100.0**(308) | **100.0**(126) | **100.0**(120) | |

B-Baseline survey *$X^2$=24.037; df = 3; p<0.001 R-Repeat survey **$X^2$=13.638; df = 3; p<0.003

No significant difference was observed in the responses of children by gender or by BMI classification.

### 5.3.5.2 Packed lunch

Nearly half of the children answered that their parents chose what was included in their packed lunch, 10% that they and a parent chose and 40% that they alone chose the contents of their packed lunches. No significant difference was observed in who chose the packed lunch items by schools, gender or BMI classification.

### 5.3.5.3 Evening meal

Between half and two thirds of the children indicated that the evening meal was chosen by their parents, with a further 10 to 20% chosen by a parent and themselves and a fifth chose their own meals. Differences were observed within the intervention schools (p<0.018) where fewer parents and more parent and child chose the evening meal at the repeat survey. No differences were observed between schools at any stage. Full details are provided in Table 55.

**Table 55 A comparison of who chose the evening meal in intervention and control schools in the baseline, repeat and final surveys.**

| | | Intervention | | | Control | | | P value |
|---|---|---|---|---|---|---|---|---|
| | | **Baseline** | **Repeat** | **Final** | **Baseline** | **Repeat** | **Final** | |
| Who chose the evening meal | | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | |
| | | | | | | | | |
| | Child | **18.0** (52) | **19.9** (30) | **20.6** (51) | **23.9** (75) | **20.6** (27) | **14.0** (17) | |
| | Parent | **68.5** (198) | **57.6** (87) | **70.2** (174) | **58.0** (182) | **65.6** (86) | **70.3** (85) | <0.018 I |
| | Child+parent | **10.4** (30) | **18.5** (28)* | **7.6** (19) | **13.0** (41) | **10.7** (14) | **11.6** (14) | |
| | Other | **3.1** (9) | **4.0** (6) | **1.6** (4) | **5.1 (**16) | **3.1 (**4) | **4.1 (**5) | |
| | Total | **100.0**(289) | **100.0**(151) | **100.0**(248) | **100.0**(314) | **100.0**(131) | **100.0**(121) | |

I-Intervention schools *$X^2$=15.282; df = 6; p<0.018

No differences were observed in the responses of children by gender or by BMI classification.

## 5.4 Psychological well-being

The results of body shape dissatisfaction for each survey together with well-being are presented to establish whether the intervention had any negative effects on children's well-being.

### 5.4.1 Body shape dissatisfaction

No significant differences were observed between schools or within schools with the body shape dissatisfaction scores of boys. In all surveys over half of the boys reported no discrepancy between perceived and desired shape and between a quarter and a third desired to be thinner.

Similarly no significant differences were observed between or within schools with the body shape dissatisfaction sores of girls. For girls just under a half reported no discrepancy between their perceived and desired shape and a similar proportion desired to be thinner in all surveys. Full details are provided in Table 56.

**Table 56 Body shape dissatisfaction scores for boys and girls for each survey round**

| Body shape Satisfaction score Boys | score | Intervention schools | | | Control schools | | |
|---|---|---|---|---|---|---|---|
| | | **B** | **R** | **F** | **B** | **R** | **F** |
| | | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) |
| | -1 | **8.8** (13) | **12.3** (10) | **11.3** (15) | **15.6** (28) | **7.9** (5) | **16.7** (10) |
| | 0 | **58.1** (86) | **59.3** (48) | **50.4** (67) | **56.4** (101) | **60.3** (38) | **53.3** (32) |
| | +1 | **19.6** (29) | **17.3** (14) | **30.8** (41) | **18.4** (33) | **27.0** (17) | **26.7** (16) |
| | +2 | **13.5** (20) | **11.1** (9) | **7.5** (10) | **9.5** (17) | **4.8** (3) | **3.3** (2) |
| | All + scores | **33.1** (49) | **28.4** (23) | **38.3** (51) | **27.9** (50) | **31.8** (20) | **30.0** (18) |
| Total | | **100.0** (148) | **100.0** (81) | **100.0** (133) | **100.0** (179) | **100.0** (63) | **100.0** (60) |

-score=desire to be heavier, 0=no discrepancy, +score=desire to be thinner

| Body shape Satisfaction score Girls | score | Intervention schools | | | Control schools | | |
|---|---|---|---|---|---|---|---|
| | | **B** | **R** | **F** | **B** | **R** | **F** |
| | | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) |
| | -1 | **9.9** (15) | **10.0** (8) | **10.9** (14) | **9.3** (14) | **12.3** (9) | **13.0** (9) |
| | 0 | **45.7** (69) | **42.5** (34) | **48.1** (62) | **48.3** (73) | **45.2** (33) | **42.0** (29) |
| | +1 | **29.8** (45) | **25.0** (20) | **31.8** (41) | **29.8** (45) | **31.5** (23) | **30.4** (21) |
| | +2 | **14.6** (22) | **22.5** (18) | **9.3** (12) | **12.6** (19) | **11.0** (8) | **14.5** (10) |
| | All + scores | **44.4** (67) | **47.5** (38) | **41.1** (53) | **42.4** (64) | **42.5** (31) | **44.9** (31) |
| Total | | **100.0** (151) | **100.0** (80) | **100.0** (129) | **100.0** (151) | **100.0** (73) | **100.0** (69) |

-score=desire to be heavier, 0=no discrepancy, +score=desire to be thinner

### 5.4.2 Other children making fun of me

In all three surveys around a half of children responded that being made fun of hardly worried them, a third worried a little and the remainder (under 20%) worried a lot. In the intervention schools the percentage of children who hardly ever worried about being made fun of decreased between surveys with an increase in the percentage that worried a little ($p<0.009$). No difference was observed between the intervention or control schools at any survey (Table 57).

**Table 57 Comparison of children's responses to whether they worried about other children making fun of them between intervention and control schools.**

| Other children making fun of me | Intervention | | | Control | | | P value |
|---|---|---|---|---|---|---|---|
| | **Baseline** | **Repeat** | **Final** | **Baseline** | **Repeat** | **Final** | |
| | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | |
| | | | | | | | |
| Worries me a lot | **14.1** (42) | **19.3** (31) | **16.4** (43) | **14.7** (48) | **14.0** (19) | **15.4** (20) | <0.009 I |
| Worries me a little | **30.6** (91) | **39.1** (63) | **41.8** (110) | **30.4** (99) | **32.4** (44) | **35.4** (46) | |
| Hardly ever worries me | **55.3** (164) | **41.6** (67) | **41.8**(110)* | **54.9** (179) | **53.6** (73) | **49.2** (64) | |
| Total | **100.0**(297) | **100.0**(161) | **100.0**(263) | **100.0**(326) | **100.0**(136) | **100.0**(130) | |

I-Intervention schools *$X^2$=13.543; df = 4; p<0.009

No difference was observed in the responses of children within the BMI groups but a significant difference was observed between gender in both the baseline and repeat survey ($p<0.001$ B, $p<0.031$ R). Girls were more likely to be worried about being made fun of and this was consistent for all surveys but did not reach significance in the final surveys (Table 58).

**Table 58 Comparison of children's responses by gender to whether they worried about other children making fun of them in all schools at baseline, repeat and final surveys.**

| Other children making fun of me | Boys | | | Girls | | | P value |
|---|---|---|---|---|---|---|---|
| | **Baseline** | **Repeat** | **Final** | **Baseline** | **Repeat** | **Final** | |
| | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | |
| | | | | | | | |
| Worries me a lot | **10.6** (34) | **12.6** (18) | **13.1** (26) | **18.2** (55) | **20.8** (32) | **19.1** (37) | <0.001 B |
| Worries me a little | **27.2** (87) | **32.9** (47) | **37.9** (75) | **34.1** (103) | **39.0** (60) | **41.2** (80) | <0.031 R |
| Hardly ever worries me | **62.2** (199) | **54.5** (78) | **49.0** (97) | **47.7** (144) | **40.2** (62) | **39.7** (77) | |
| Total | **100.0**(320) | **100.0**(143) | **100.0**(198) | **100.0**(302) | **100.0**(154) | **100.0**(194) | |

B-baseline survey R-repeat survey

### 5.4.3 Called names

No difference was observed between the intervention and control schools for all surveys in the responses of children to being worried about being called names.

No difference was observed in the responses of children within the BMI groups to being called names but a significant difference was observed between gender. A higher percentage of girls were worried about being called names and with nearly a quarter answering 'worries me a lot' in the repeat and final survey. This was consistent for all surveys and observed in intervention and control schools, full details for all schools are shown in Table 59.

**Table 59 Comparison of children's responses according to gender to whether they worried about being called names in all schools at baseline, repeat and final surveys.**

| Being called names | Boys | | | Girls | | | P value |
|---|---|---|---|---|---|---|---|
| | **Baseline** | **Repeat** | **Final** | **Baseline** | **Repeat** | **Final** | |
| | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | |
| | | | | | | | |
| Worries me a lot | **11.2** (36) | **14.2** (20) | **15.8** (31) | **19.3** (58) | **24.2** (37) | **23.3** (45) | <0.005 B |
| Worries me a little | **31.9** (102) | **30.5** (43) | **33.7** (66) | **34.7** (104) | **40.5** (62) | **39.4** (76) | <0.002 R |
| Hardly ever worries me | **56.9** (182) | **55.3** (78) | **50.5** (99) | **46.0** (138) | **35.3** (54) | **37.3** (72) | <0.023 F |
| Total | **100.0**(320) | **100.0**(141) | **100.0**(196) | **100.0**(300) | **100.0**(153) | **100.0**(193) | |

B-Baseline survey, R-Repeat survey, F-Final survey

### 5.4.4 How you feel about yourself

No difference was observed between the intervention and control schools in how children described themselves during the surveys but a difference was observed within the control schools between surveys. For the control schools in the repeat survey more children described themselves as happy and fewer described themselves as OK. In the final survey those describing themselves as happy and very happy had decreased and more children described themselves as OK (Table 60).

**Table 60 Comparison of children's responses to how they described themselves between intervention and control schools.**

| How you feel about yourself | Intervention | | | Control | | | P value |
|---|---|---|---|---|---|---|---|
| | **Baseline** | **Repeat** | **Final** | **Baseline** | **Repeat** | **Final** | |
| | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | |
| | | | | | | | |
| Very unhappy | **3.3** (10) | **4.3** (7) | **3.0** (8) | **4.2** (14) | **2.8** (4) | **1.6** (2) | <0.027 C |
| Unhappy | **2.3** (7) | **3.7** (6) | **2.2** (6) | **4.5** (15) | **2.1** (3) | **3.9** (5) | |
| OK | **16.4** (49) | **14.7** (24) | **14.1** (38) | **17.1** (57) | **9.9** (14) | **24.0** (31) | |
| Happy | **28.1** (84) | **24.5** (40) | **30.5** (82) | **22.2** (74) | **32.6** (46) | **27.1** (35) | |
| Very happy | **49.9** (149) | **52.8** (86) | **50.2** (135) | **52.0** (173) | **52.6** (74) | **43.4** (56) | |
| Total | **100.0**(299) | **100.0**(163) | **100.0**(269) | **100.0**(333) | **100.0**(141) | **100.0**(129) | |

C- Control schools

The significant differences observed in the responses of boys and girls in the baseline survey were not apparent in the re peat or final surveys. The significant difference observed in the responses of the children within the different BMI groups in the baseline was also observed in the repeat surveys. Over 80% of thin/healthy group of children described themselves as happy/very happy compared to around two thirds of the overweight/obese group of children and over twice as many of the overweight/obese groups chose the unhappy faces compared to the thin/healthy group. (Table 61).

**Table 61 Comparison of children's responses to how they described themselves by BMI group in all schools.**

| How you feel about yourself | All schools | | | | P value |
|---|---|---|---|---|---|
| | **Baseline** | | **Repeat** | | |
| | Thin/healthy | Overweight/obese | Thin/healthy | Overweight/obese | |
| | % (n) | % (n) | % (n) | % (n) | |
| Very unhappy/unhappy | **4.2** (15) | **14.2** (25) | **4.6** (9) | **10.8** (9) | <0.001 B<br><0.003 R |
| OK | **13.6** (48) | **21.6** (38) | **9.2** (18) | **20.5** (17) | |
| Happy/very happy | **82.2** (290) | **64.2** (113) | **86.2** (169) | **68.7** (57) | |
| Total | **100.0** (353) | **100.0** (176) | **100.0** (196) | **100.0** (83) | |

B-Baseline survey, R-Repeat survey

Differences between the BMI groups were also seen in the intervention schools for both surveys and in the control schools at the baseline survey. In the intervention schools the percentage in the overweight/obese group that chose the unhappy faces increased in the repeat survey whereas in the control schools the percentage decreased, the responses of the thin/healthy group remained the same (Table 62).

**Table 62 Comparison of children's responses by BMI group to how they described themselves in the intervention and control schools at baseline and repeat surveys.**

| How you feel about yourself recoded | **Intervention** | | | | **Control** | | | | P value |
|---|---|---|---|---|---|---|---|---|---|
| | **Baseline** | | **Repeat** | | **Baseline** | | **Repeat** | | |
| | Thin/ healthy | Overwt/ obese | Thin/ healthy | Overwt/ obese | Thin/ healthy | Overwt/ obese | Thin/ healthy | Overwt/ obese | |
| | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | Baseline |
| Very unhappy/unhappy | **4.3** (6) | **8.8** (5) | **5.1** (5) | **14.6** (6) | **4.2** (9) | **16.8** (20) | **4.1** (4) | **7.1** (3) | <0.022 I <0.001C |
| OK | **11.4** (16) | **24.6** (14) | **10.1** (10) | **26.8** (11) | **15.0** (32) | **20.2** (24) | **8.2** (8) | **14.3** (6) | Repeat <0.003 I |
| Happy/very happy | **84.3** (118) | **66.6** (38) | **84.8** (84) | **58.6** (24) | **80.8** (172) | **63.0** (75) | **87.7** (85) | **78.6** (33) | ns C |
| Total | **100.0** (140) | **100.0** (57) | **100.0** (99) | **100.0** (41) | **100.0** (213) | **100.0** (119) | **100.0** (97) | **100.0** (42) | |

I-intervention schools, C-control schools

## 5.5 Anthropometric data

### 5.5.1 Heights and weights

The mean height, weight and BMI by age of boys and girls are presented in Tables 63 and 64, together with the minimum and maximum values.

**Table 63 Mean height, weight and BMI of children at the baseline survey**

| | | **Height** (cm) | | | | **Weight** (kg) | | | | **BMI** ($kg/m^2$) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age (years) | n | Mean | SD | Min | Max | Mean | SD | Min | Max | Mean | SD | Min | Max |
| Boys | | | | | | | | | | | | | |
| 9 | 54 | 138.1 | 4.4 | 129.1 | 149.3 | 33.5 | 5.62 | 24.2 | 54.3 | 17.51 | 2.42 | 13.83 | 26.55 |
| 10 | 139 | 142.8 | 6.9 | 127.7 | 157.0 | 38.3 | 9.70 | 25.2 | 70.9 | 18.58 | 3.58 | 13.90 | 30.90 |
| 11 | 83 | 146.6 | 7.1 | 128.0 | 167.5 | 41.8 | 10.76 | 26.5 | 88.0 | 19.25 | 3.72 | 13.89 | 32.96 |
| Girls | | | | | | | | | | | | | |
| 9 | 40 | 138.4 | 6.9 | 127.0 | 153.9 | 35.4 | 8.99 | 24.0 | 60.2 | 18.25 | 3.24 | 14.48 | 28.08 |
| 10 | 135 | 143.0 | 7.7 | 122.0 | 158.6 | 38.9 | 9.35 | 24.1 | 68.8 | 18.88 | 3.53 | 13.37 | 29.01 |
| 11 | 85 | 148.4 | 7.6 | 129.4 | 163.5 | 45.4 | 12.72 | 22.6 | 76.7 | 20.38 | 4.48 | 12.40 | 32.34 |

SD = standard deviation

**Table 64 Mean height, weight and BMI of children at the repeat survey**

| | | Height (cm) | | | | Weight (kg) | | | | BMI ($kg/m^2$) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age (years) | n | Mean | SD | Min | Max | Mean | SD | Min | Max | Mean | SD | Min | Max |
| Boys | | | | | | | | | | | | | |
| 9 | 10 | 136.2 | 7.2 | 125.7 | 145.5 | 31.8 | 5.41 | 25.3 | 40.7 | 17.04 | 1.75 | 14.77 | 19.90 |
| 10 | 69 | 144.5 | 6.9 | 126.5 | 160.8 | 38.5 | 8.62 | 24.1 | 61.1 | 18.30 | 3.22 | 13.14 | 28.74 |
| 11 | 60 | 148.1 | 7.1 | 135.0 | 166.7 | 43.2 | 11.00 | 27.5 | 76.0 | 19.50 | 3.84 | 13.38 | 31.68 |
| Girls | | | | | | | | | | | | | |
| 9 | 6 | 138.3 | 7.9 | 126.0 | 147.6 | 34.3 | 9.55 | 24.2 | 52.1 | 17.68 | 3.29 | 15.07 | 23.91 |
| 10 | 80 | 144.6 | 8.1 | 126.9 | 164.0 | 40.8 | 11.90 | 23.7 | 82.3 | 19.24 | 4.15 | 14.39 | 33.03 |
| 11 | 60 | 148.1 | 7.6 | 133.0 | 166.0 | 42.4 | 11.75 | 26.4 | 91.1 | 19.16 | 4.19 | 13.67 | 37.68 |

SD = standard deviation

Mean height, weight and BMI were higher for girls compared to boys at all ages in the baseline survey and for ages 9 and 10 in the repeat survey. The mean BMI for both boys and girls was at or above the 75$^{th}$ centile of the reference population for all ages.

### 5.5.2 Subject characteristics according to ethnic background

The mean weight, height and BMI of both boys and girls were compared to see if there were any differences between ethnic background. Details for the baseline survey are provided in Tables 65 and 66.

For boys the highest recorded weight and height was for boys of Asian background, but due to the very small sample size in all surveys it is not possible to draw any meaningful conclusion from this. Black boys had the highest mean values for weight and height at all ages but not the highest mean BMI which varied between the ethnic groups depending on age, indicating that Black boys are larger but in proportion.

**Table 65 Mean height, weight and BMI of boys according to ethnic background at baseline**

| | | Height (cm) | | | | Weight (kg) | | | | BMI ($kg/m^2$) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ethnicity | n | Mean | SD | Min | Max | Mean | SD | Min | Max | Mean | SD | Min | Max |
| Age 9 | | | | | | | | | | | | | |
| White | 39 | 137.8 | 4.2 | 129.1 | 147.4 | 32.68 | 5.17 | 24.2 | 44.3 | 17.14 | 2.14 | 13.83 | 22.38 |
| Black | 10 | 139.9 | 5.3 | 130.7 | 149.3 | 36.30 | 7.27 | 29.0 | 54.3 | 18.52 | 3.29 | 15.20 | 26.55 |
| Other | 4 | 137.4 | 4.4 | 133.2 | 142.9 | 34.83 | 4.77 | 27.9 | 38.4 | 18.47 | 2.68 | 15.40 | 21.64 |
| Asian | 1 | 134.8 | | | | 32.50 | | | | 17.89 | | | |
| Age 10 | | | | | | | | | | | | | |
| White | 100 | 142.4 | 6.8 | 127.7 | 157.0 | 38.39 | 10.21 | 25.2 | 69.8 | 18.73 | 3.86 | 13.90 | 30.90 |
| Black | 20 | 147.0 | 6.8 | 134.0 | 156.1 | 40.30 | 9.97 | 29.0 | 70.9 | 18.48 | 3.36 | 15.11 | 29.25 |
| Other | 18 | 140.5 | 5.5 | 128.2 | 148.3 | 35.05 | 5.13 | 27.6 | 48.2 | 17.68 | 1.72 | 14.34 | 21.92 |
| Asian | 1 | 145.0 | | | | 45.70 | | | | 21.74 | | | |
| Age 11 | | | | | | | | | | | | | |
| White | 68 | 146.2 | 7.2 | 128.0 | 167.5 | 40.31 | 9.34 | 26.5 | 67.1 | 18.72 | 3.25 | 13.89 | 29.91 |
| Black | 7 | 150.3 | 6.8 | 141.7 | 159.6 | 47.31 | 10.29 | 32.2 | 62.1 | 20.82 | 3.74 | 16.04 | 25.80 |
| Other | 3 | 144.1 | 3.8 | 137.7 | 146.7 | 34.93 | 3.82 | 32.2 | 39.3 | 16.83 | 1.76 | 14.96 | 18.46 |
| Asian | 4 | 149.9 | 9.1 | 143.9 | 163.4 | 59.93 | 19.18 | 46.0 | 88.0 | 26.17 | 4.85 | 22.21 | 32.96 |

SD = standard deviation

The number of 9 year old girls was too small to make any meaningful comparisons by ethnic background. For the 10 and 11 year old girls the highest mean values for weight and height was in Black girls but the highest mean BMI was in white 10 year olds and black 11 year old girls, indicating that Black girls are larger but in proportion.

**Table 66 Mean height, weight and BMI of girls according to ethnic background in the baseline survey**

| | | Height (cm) | | | | Weight (kg) | | | | BMI ($kg/m^2$) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ethnicity | n | Mean | SD | Min | Max | Mean | SD | Min | Max | Mean | SD | Min | Max |
| Age 9 | | | | | | | | | | | | | |
| White | 29 | 137.7 | 6.2 | 127.0 | 153.6 | 34.81 | 8.76 | 24.0 | 60.2 | 18.18 | 3.29 | 14.64 | 28.08 |
| Black | 8 | 139.1 | 9.4 | 131.7 | 153.9 | 35.90 | 10.41 | 25.5 | 53.4 | 18.26 | 3.46 | 14.48 | 24.31 |
| Other | 2 | 143.6 | 7.4 | 138.4 | 148.8 | 40.65 | 13.22 | 31.3 | 50.0 | 19.46 | 4.41 | 16.34 | 22.58 |
| Asian | 1 | 143.8 | | | | 36.80 | | | | 17.80 | | | |
| Age 10 | | | | | | | | | | | | | |
| White | 103 | 142.3 | 7.2 | 122.0 | 158.6 | 39.06 | 9.40 | 24.1 | 65.8 | 19.13 | 3.61 | 13.69 | 28.27 |
| Black | 15 | 149.0 | 6.1 | 138.0 | 158.1 | 41.60 | 11.15 | 28.7 | 68.8 | 18.62 | 4.31 | 13.37 | 29.01 |
| Other | 13 | 141.5 | 10.0 | 124.7 | 156.0 | 35.05 | 7.16 | 24.7 | 47.1 | 17.33 | 1.70 | 14.20 | 19.58 |
| Asian | 3 | 143.5 | 9.3 | 135.1 | 153.5 | 36.87 | 3.23 | 33.2 | 39.3 | 17.95 | 1.67 | 16.17 | 19.49 |
| Age 11 | | | | | | | | | | | | | |
| White | 61 | 147.4 | 7.6 | 129.4 | 163.5 | 44.61 | 12.40 | 22.6 | 76.7 | 20.30 | 4.53 | 12.42 | 32.34 |
| Black | 10 | 154.6 | 5.3 | 144.4 | 162.2 | 53.36 | 13.91 | 39.0 | 72.7 | 22.15 | 4.74 | 16.51 | 29.49 |
| Other | 12 | 147.2 | 6.0 | 136.7 | 157.3 | 41.57 | 8.71 | 32.1 | 65.4 | 19.09 | 3.31 | 15.89 | 28.72 |
| Asian | 2 | 152.7 | 13.9 | 142.8 | 162.5 | 52.50 | 29.27 | 31.8 | 73.2 | 21.66 | 8.57 | 15.59 | 27.72 |

SD = standard deviation

### 5.5.3 BMI z scores

The BMI z scores of children were calculated using the WHO AnthroPlus programme. The mean BMI z score for intervention and control schools for both baseline and repeat survey were similar and details are provided in table 67.

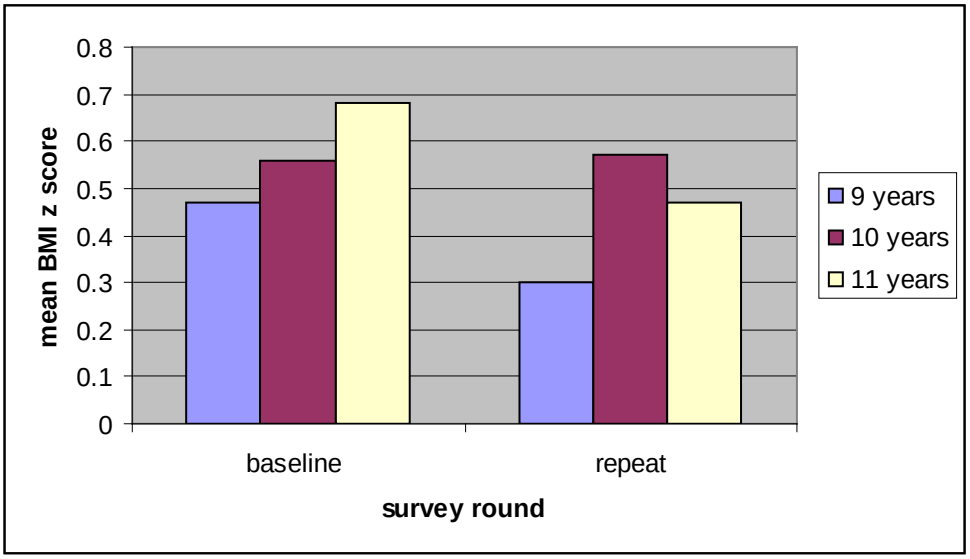
**Table 67 Mean BMI z scores for children in the baseline and repeat surveys**

| | Baseline survey | | | Repeat survey | | |
|---|---|---|---|---|---|---|
| | Mean z score | SD | number | Mean z score | SD | number |
| Intervention | 0.51 | 1.25 | 198 | 0.49 | 1.35 | |
| control | 0.63 | 1.26 | 335 | 0.53 | 1.21 | |
| All schools | 0.58 | 1.25 | 533 | 0.51 | 1.28 | 285 |

SD = standard deviation

In the baseline survey mean BMI z score increased with age but in the repeat survey the highest mean BMI z score was seen in children aged 10 years, Table 68.

**Table 68 Mean BMI Z score by age of children in the baseline and repeat surveys**




Details for all children for both baseline and repeat surveys are presented in Figures 48 and 49 with comparison to the WHO Reference 2007 standard for children 5-19 years. For children 5-19 years the +1SD in the WHO reference is equivalent to the 85$^{th}$ centile

(overweight) and the +2SD is equivalent to the 97$^{th}$ centile (obese). These graphs show that the proportion of children in Bexley who were overweight and obese were much higher than the reference values in both surveys and that children around 3% of children had a z score of +3SD which corresponds to the adult BMI of 35. A similar distribution was seen for both boys and girls which are shown in Figures 50 and 51.

**Fig 48 BMI z scores for all children in the baseline survey**

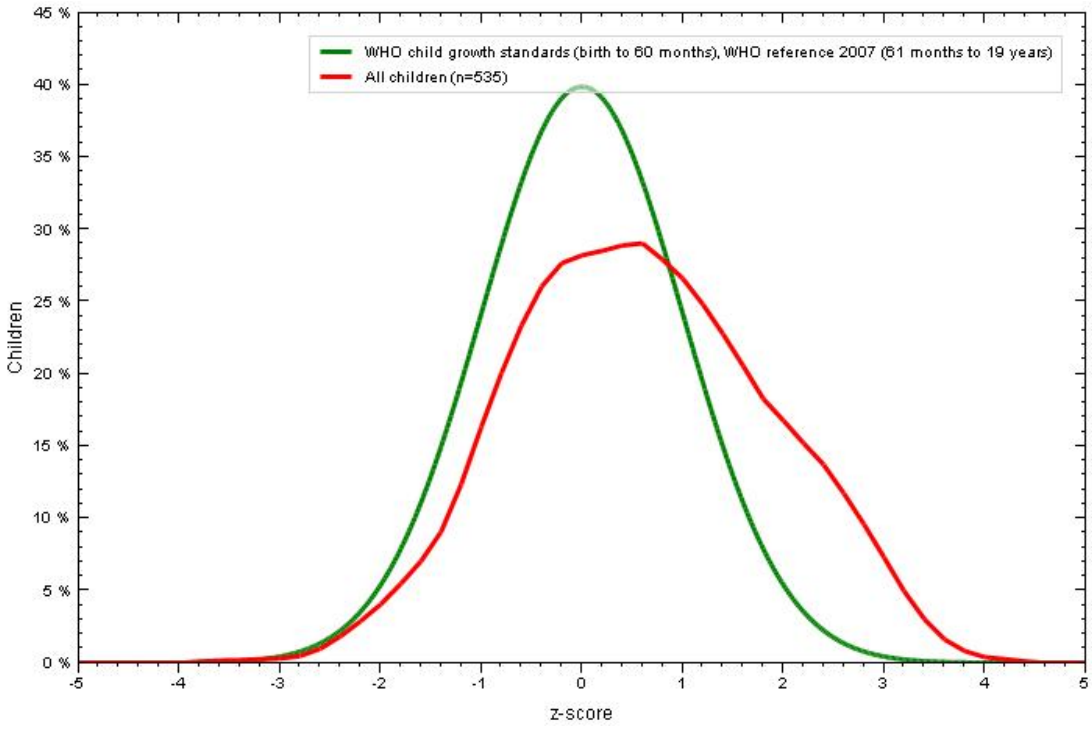


**Fig 49 BMI z scores for all children in the repeat survey**

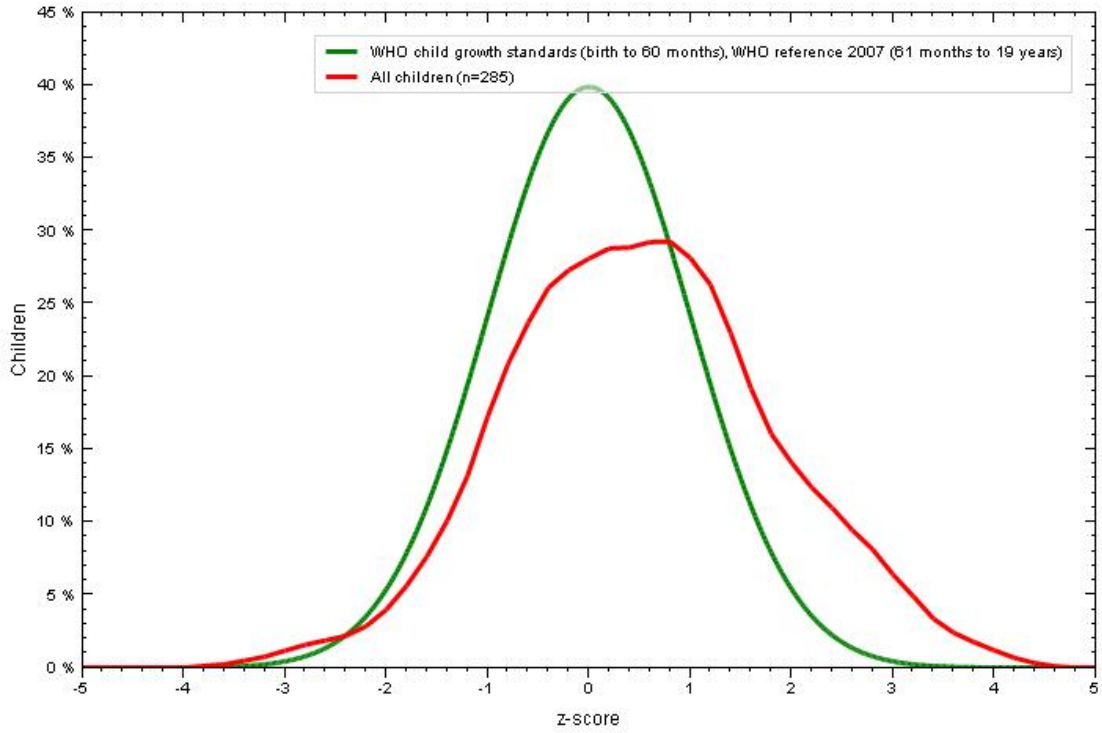



**Fig 50 BMI z scores for all children by gender in the baseline survey**

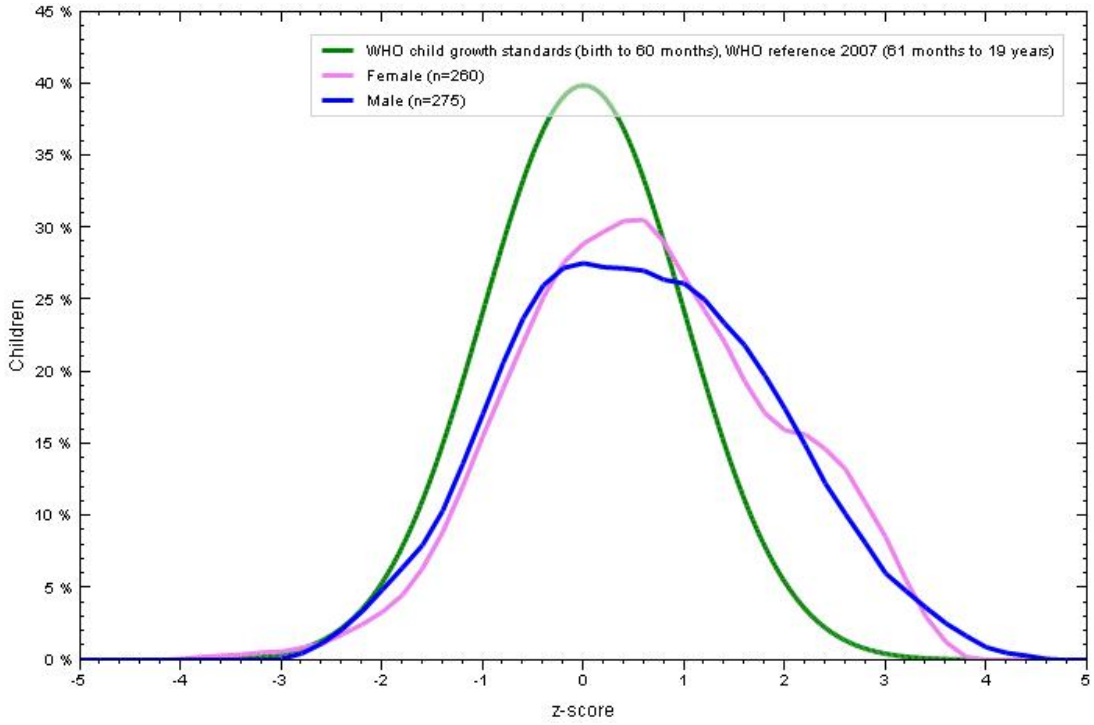
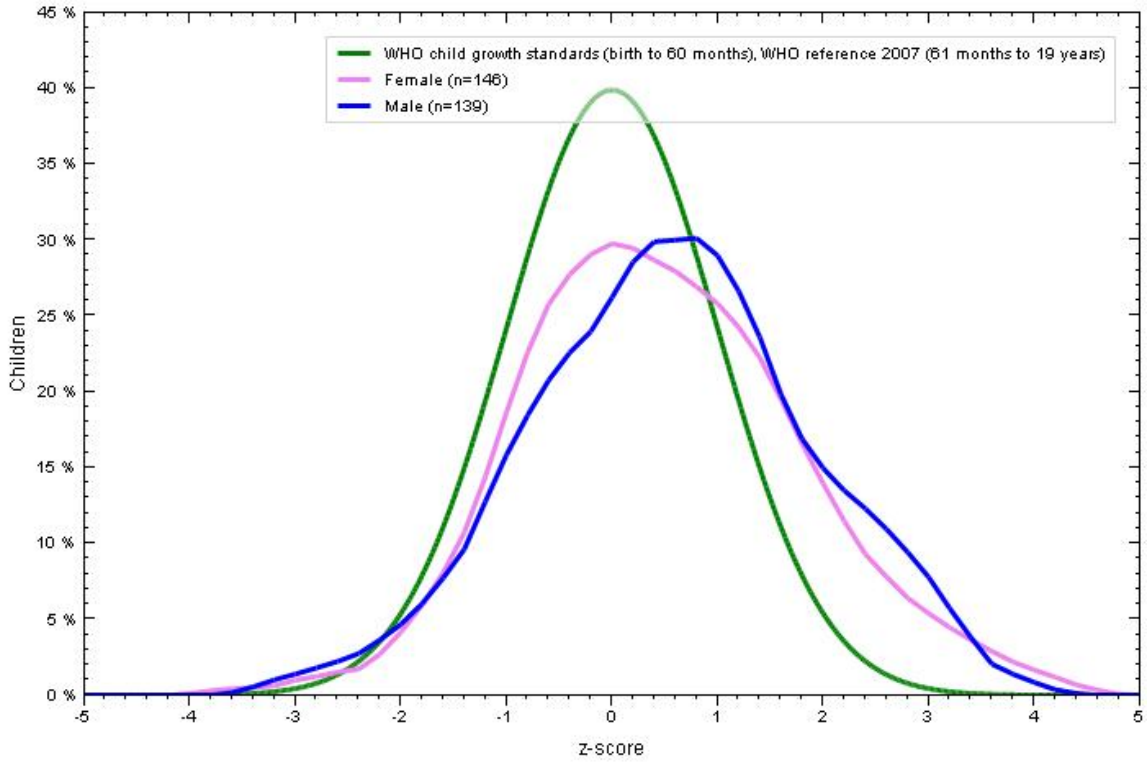


**Fig 51 BMI z scores for all children by gender in the repeat survey**




### 5.5.4 Prevalence of obesity in Bexley

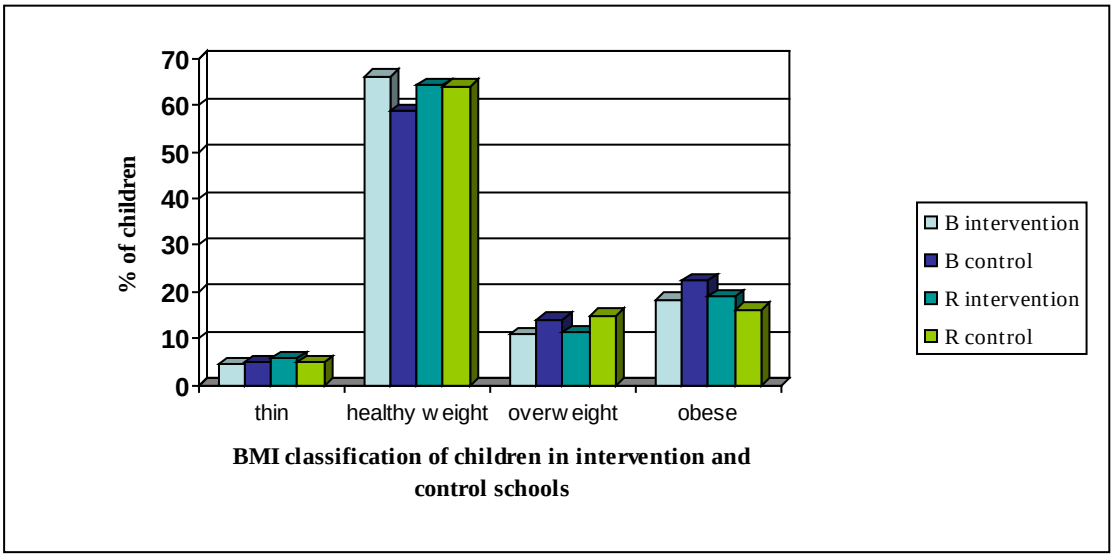
To be able to compare prevalence of obesity with the HSE and NCMP results the children were classified into four groups (thin, healthy weight, overweight and obese) using the UK BMI cut-off points. Nearly two thirds of children were within the healthy weight range, one third in the overweight and obese categories and fewer than 5.5% of children in the thin category. In both surveys the percentage of children who were obese was higher than those who were overweight (Table 69).

**Table 69 Comparison of BMI classification for all children based on the UK national percentile at baseline and repeat survey**

| | **BMI classification ( UK national percentile cut-off)** | | | | |
|---|---|---|---|---|---|
| Survey | **Thin** | **Healthy weight** | **Overweight** | **Obese** | **Total** |
| | % (n) | % (n) | % (n) | % (n) | |
| Baseline | **4.6** (25) | **61.6** (330) | **12.9** (69) | **20.9** (112) | **100.0** (536) |
| Repeat | **5.3** (15) | **64.2** (183) | **13.0** (37) | **17.5** (50) | **100.0** (285) |

The results for the intervention and control schools are provided in Figure 52. No significant difference in the prevalence of overweight or obese was observed at either survey.

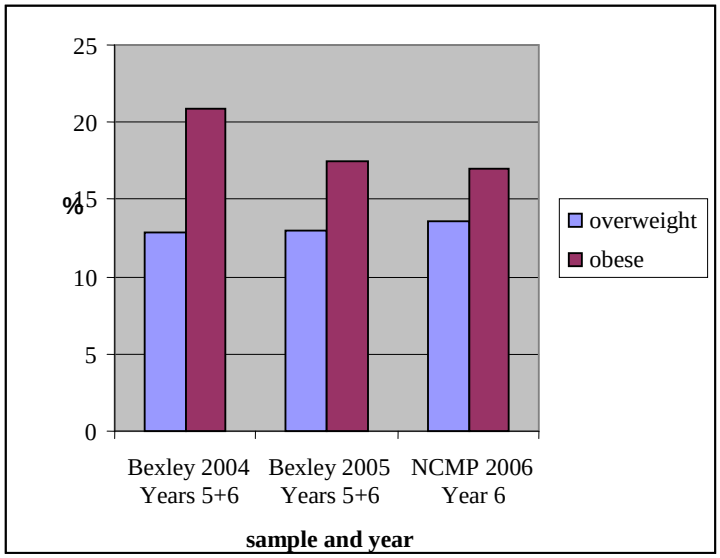
**Fig 52 A comparison of the proportion of children in each BMI (UK) classification in intervention and control schools at baseline and repeat surveys**




B-Baseline survey R-repeat survey

The results of the incidence of overweight and obese children found in the baseline and repeat survey were compared to the results of the Bexley NCMP 2006 (provided by Bexley Primary Care Trust) as no measurements were collected in the final survey round. The proportion of overweight children were similar in all three samples but the proportion of obese children in the baseline survey was higher than the repeat and NCMP (20.9%, 17.5% and 17.0% respectively). Details are provided in Figure 53.

**Fig 53 Prevalence of obesity and overweight in Bexley children compared to Bexley NCMP results 2006**




### 5.5.4.1 BMI classification according to gender of all children

There was no statistically significant difference between boys and girls in the prevalence of overweight or obesity. A higher percentage of boys were overweight (including obese) in the baseline and repeat surveys (34.8 and 31.6% respectively) compared to girls (32.7 and 29.5%). (Table 70).

**Table 70 Comparison of BMI classification according to gender for all children based on the UK national percentile at baseline and repeat survey**

| | BMI classification ( UK national percentile cut-off) | | | | |
|---|---|---|---|---|---|
| Survey | **Thin** | **Healthy weight** | **Overweight** | **Obese** | **Total** |
| **Baseline** | % (n) | % (n) | % (n) | % (n) | |
| Boy | **4.7** (13) | **60.5** (167) | **13.8** (38) | **21.0** (58) | **100.0** (276) |
| Girl | **4.6** (12) | **62.7 (**163) | **11.9** (31) | **20.8** (54) | **100.0 (**260) |
| **Repeat** | | | | | |
| Boy | **5.0** (7) | **63.4** (88) | **12.2** (17) | **19.4** (27) | **100.0** (139) |
| Girl | **5.4** (8) | **65.1** (95) | **13.7** (20) | **15.8** (23) | **100.0** (146) |

### 5.5.4.2 BMI classification according to ethnic description

When comparing UK BMI classification by ethnic description just under two thirds of White and Black children were in the healthy weight category and about a third were in

the overweight/obese categories in both surveys. Children from 'Other' backgrounds had a higher proportion of children in the healthy weight category, this difference being more marked in the baseline survey.

Black children had the highest percentage of children in the overweight (including obese) categories and the highest percentage in the obese category in both surveys. Few children were classed as underweight but White children had the highest proportion of thin children in both surveys. Asian children had the highest percentage of obese children at baseline, but this result included only small numbers of children. Full details are provided in Table 71.

**Table 71 A comparison of BMI classification (UK) according to ethnic background for all children in the baseline and repeat surveys**

| | **BMI classification ( UK national percentile cut-off)** | | | | |
|---|---|---|---|---|---|
| Ethnic description | **Thin** | **Healthy weight** | **Overweight** | **Obese** | **Total** |
| **Baseline** | % (n) | % (n) | % (n) | % (n) | |
| White | **5.5** (22) | **59.2** (237) | **14.5** (58) | **20.8** (83) | **100.0** (400) |
| Black | **1.4** (1) | **61.5 (**43) | **11.4** (8) | **25.7** (18) | **100.0** (70) |
| Other | **3.8** (2) | **82.7** (43) | **5.8** (3) | **7.7** (4) | **100.0** (52) |
| Asian | **0** | **50.0** (6) | **0** | **50.0** (6) | **100.0** (12) |
| **Repeat** | | | | | |
| White | **7.2** (14) | **62.6** (122) | **13.3** (26) | **16.9** (33) | **100.0** (195) |
| Black | **2.2** (1) | **62.2** (28) | **15.6** (7) | **20.0** (9) | **100.0** (45) |
| Other | **0** | **71.4** (25) | **8.6** (3) | **20.0** (7) | **100.0** (35) |
| Asian | **0** | **77.8** (7) | **11.1** (1) | **11.1** (1) | **100.0** (9) |

In summary one third of Bexley children were overweight or obese with the mean BMI for both boys and girls at or above the 75$^{th}$ centile of the reference population. No significant difference was observed between intervention and control schools at either survey round.

# CHAPTER 6

# DISCUSSION

## 6.0 Discussion

This current study aimed to develop, implement and evaluate a programme of intervention to contribute towards promoting healthy weight in children in the most deprived wards in Bexley and identify the prevalence of overweight and obesity in children aged 9-11 years in the borough.

### 6.1 Theory and behaviour change

The **Be healthy** intervention was developed using similar principles to the behaviour change guidelines produced by NICE in 2007, with the intervention based on a local needs assessment, tailored to meet the specific needs of the target group and evaluation included as an integral part of the study (NICE, 2007).

The aim of the **Be healthy** intervention was to promote healthier lifestyles for children using a school-based programme. Young children's relative lack of autonomy needs to be considered when developing behaviour change interventions for primary school children who will have limited control over diet and exercise choices. It is likely that increasing children's knowledge will have limited impact on behaviour change if the home and school environment is not also considered. The effectiveness of any intervention focusing on children can be restricted if those with influence over choice are not involved or aware of the programme. Parents or carers create a home environment that is conducive to active or sedentary behaviour, they select the types of meals eaten and model eating and physical activity behaviours (Story *et al.,* 2006). Parenting behaviour and parenting styles are

crucial to a child's eating habits especially in the pre-school years and appear to influence a child's BMI (Bowne, 2009).

Potential barriers to change identified in the planning phase of this intervention included lack of parental agreement to the change being advocated in the intervention, limited availability of fruit and vegetables for the school meal and limited playtime activities for children at school. The potential effects of these barriers to behaviour change were minimized by engaging with parents at the onset of the intervention and encouraging schools to improve access to playtime activities. There was limited success with direct parental engagement with the intervention with responses to the initial questionnaire varying from 3 to 41% in the four schools and delivery of the parent session on healthy lunchbox occurring in two schools. A low participation for outside home activities is a similar finding of previous studies (Reynolds et al., 2000). Indirect engagement with parents continued throughout the intervention with resources and activities taken home as part of each session as this is thought to be the most effective method to involve parents (Blanchette and Brug, 2005).

Enabling factors such as access to food in a works canteen or school meal, or opportunity to be active during work or school may be similar for both children and adults. However change related factors including attitude, norms and self-efficacy are different in children compared to adults as children are in the transition process of socialization (the process of learning the attitudes, values and behaviours of a society) from childhood into adult independence. Croghan (2007) describes three types of socialization, primary socialization

that occurs in early childhood that is based on familial and community expectations, secondary socialization that is based on peer group and anticipatory socialization that describes the way a young person rehearses for the future. The failure to fully implement the SCT concept of facilitation in this study limited the influence of the environment to support increasing intake of fruit and vegetables. Schools inclusion of activities at playtime encouraged active play but the inability to increase availability and accessibility of fruit and vegetables as part of the intervention limited the impact of this aspect of the programme on self efficacy and perceived norms. It was seen that children's intake of fruit and vegetables increased with increased availability of these foods at the school meal in the final survey.

It is thought that providing children with information and skills so that they acquire the knowledge, attitudes and behaviours to promote healthier lifestyles during this early period of socialization can lead to healthier behaviours throughout life (Brug and Klepp, 2007). School policies can influence and reinforce healthier lifestyles as was observed in this study with many dietary changes found in all schools. The positive changes in diet apparent in all schools may have been be due to alterations in school policies such as changes to the content of school meals resulting in increased availability of fruit and vegetables and prohibition of snacks, apart from fruit, at the morning breaktime.

Peer association is important to young people and will influence behaviour. Buttriss (2002) reported that the influence of peers, friends and media increases with age which has a powerful effect on body image perception and eating habits and at the same time

parental influences decline. This may have been why relatively few changes were seen in the contents of packed lunches which as previously described are subject to social norms and peer pressure whereas changes seen in breakfast choices may have been because children have more autonomy and are not likely to be subjected to peer pressure at this meal.

Risk taking is an integral part of a child's development and this involves lifestyle choices. Public health programmes need to be able to influence the decision making process that a child makes when deciding to take a risk by identifying appropriate health messages and understanding the context in which children make these decisions (Croghan, 2007). Self-efficacy has been shown to depend on whether individuals perceive the behaviour to be undesirable, that they need to make changes and also determines how much effort will be put in. The cultural background of the child may influence whether they perceive a change necessary and necessitates that programmes are tailored to the individual needs of the children in community interventions (Jackson *et al.*, 1991).

The obesity prevalence or lifestyle behaviours of the teachers who acted as role models in the delivery of this intervention was not recorded which may be important to children's perceptions of health-based messages intervention delivered by schoolteachers.

### 6.2 Intervention study

The subject areas chosen for the intervention were based on the results of the baseline data of this current study and findings of previous studies on the prevention of childhood obesity included in the reviews by Summerbell *et al.*, 2005 and Doak *et al*., 2006 and reviews on the determinants of fruit and vegetable intake in children including Knai *et al.*,

2006 and Adamson and Mathers, 2004. Consideration was also given to the National Diet and Nutrition Survey, the findings of the nutrition and health of school children briefing paper (Buttris, 2002) and national trends in fruit and vegetable intakes in children from areas of deprivation elicited from the annual HSE reports. The focus of the intervention was on promoting healthier breakfast choices, promotion of fruit and vegetables, contents of packed lunches and healthier snacks. The messages in the intervention were tailored to the age group, in the choice of education pack used and resources provided to supplement each session.

The aim of the intervention was to promote healthier lifestyles for children focusing on improving eating habits of children as part of a school-based programme delivered by teachers. This approach was taken because previous studies have shown some success in improving the diets of primary school children by incorporating classroom-based activities within the existing curricula (Gortmaker *et al*., 1999a). Studies in the UK including those of Sahota *et al*., 2001 and Anderson *et al.*, 2005 using a combination of classroom-based activities and increased provision of fruit and vegetables with children of a similar age have reported a modest increase in fruit or vegetable intake. Some environmental factors of the intervention such as modification of school meals and fruit tuck shop were not able to be implemented as planned which may have limited the impact of the intervention but a receptive environment, parental involvement and tasting opportunities of the programme were implemented successfully as multi-component interventions have been recommended as being most effective (Blanchette and Brug, 2005).

### 6.3 Process evaluation

Health promotion programmes should include evaluation as an integral part of the design, and using the PRECEDE model described in the methodology (chapter 2), process and outcome evaluation was included in this study. The implementation of the intervention was broadly considered to be successful with all four schools incorporating the nutrition and activity sessions into the curriculum. All 350 eligible children participated in the **Be healthy** study over a six month period with positive feedback from the schools.

Each **Be healthy** pack included evaluation forms for teacher feedback on each of the sessions which the teachers were requested to complete during the intervention period. Evaluation of the individual lessons was not possible as only two schools completed the evaluation forms for each session, overall feedback was obtained by interview with each individual school at the end of the intervention and by the completion of a general evaluation form by all schools. All schools reported completing the sessions in the pack with positive feedback from the children that took part in the study. Some of the extra-curricular activities were less successful such as the fruit tuck shops and sessions to parents. Schools showed interest in the idea of a fruit tuck shop but it was not instigated in any schools for many reasons including the perceived staff implications on running a tuck shop and problems with storage of fruit. This was also a reported finding of Kain *et al.*, 2004. Sessions to parents on packed lunches were delivered in two schools to a small group of parents; difficulty with direct parent engagement has been reported by other studies (Reynolds *et al.,* 2000). Reviews on the effectiveness of intervention programmes differ in the suggested duration of the intervention, Doak *et al.,* (2006) suggests that interventions less than 60 weeks were the most effective whereas Gaines and Turner

(2009) state that the most effective intervention was of a two year duration. Recruitment of control schools to the surveys over a period of two years proved difficult with only two of the five schools participating in the final survey whereas all intervention schools continued to participate.

For both the baseline and repeat survey it was necessary to obtain parental consent before children could take part in the survey, this was obtained via a letter that children took home and returned to the school. The response rate for the baseline survey was much higher than the repeat survey; this was possibly due to the endeavour of the teachers at the beginning of the survey and the competing interests occurring at school at the time of the repeat survey.

### 6.4 The study specific questionnaire

The questionnaire used in the survey was developed to be completed by children within a classroom environment and in the time frame of one lesson. This time constraint was determined following discussion with headteachers at local primary schools in the borough, this limited the detail and depth of questions available for some aspects of the questionnaire, in particular the well-being section.

The initial aim of the questionnaire was to determine the eating and activity patterns of children so that a tailored intervention could be produced. This study was interested in when and how often specific foods were eaten and the format of the questionnaire was based on a chronological sequence to the day. The reliability of the questionnaire was determined by comparison to other studies with children of this age group.

The questionnaire was based on self-reported information by children. There is the possibility that there was reporting bias on the responses of some children e.g. overweight children underreporting intake of unhealthy snacks and awareness of children in the intervention schools of being 'tested' post-intervention and desiring to give the right response.

### 6.5 The surveys

This included the results of any children that participated in the cross-sectional surveys; including children who were in the baseline but not repeat, children in the repeat who were not in the final survey. All children from the intervention schools in the repeat survey had exposure to the **Be healthy** intervention programme, some of these children had also taken part in the baseline survey and some completed the final survey.

### 6.6 Eating habits

Statistically significant differences were observed in the eating habits of children between surveys as shown in Table 40, of these 10 occurred solely in the intervention schools and 9 solely in the control schools. Only three significant differences between schools were observed in the repeat survey.

Over half of the changes in eating habits that occurred in both the intervention and control schools across surveys happened when the children were at school, that is at the mid-morning break and school meal. These changes in their eating habits were probably a reflection of the change in school policies during the duration of the study. In 2004 the White Paper 'Choosing Health: Making healthy choices easier' (Department of Health,

2004) was the beginning of government‘s commitment to make nutrition and physical activity part of the healthy school programme with a target that half of all schools reach healthy school status by 2006. This meant that all schools in the current study were working towards or had achieved accreditation as healthy schools by the final survey. Healthy school status included adherence to a whole school policy on healthy eating which prohibited snacks, apart from fruit, at break-times on school premises.

All school meals in the current study were served by the school contract caterer for the duration of this study and all schools offered the same menu choice. During the period of the current study national and local changes to the school menus occurred and these changes would have had an impact on both the intervention and control schools. In 2004 The Healthy Living Blueprint for Schools was published (Department for Education and Skills, 2004) which reviewed the primary school meals standards and the following year the School Meals Review Panel was established to consider nutrient-based standards for school meals. In 2006 the gradual phasing in of the new standards for school meals began. The concern about the nutritional quality of the school meals at local level led to the Borough school-meal action group initiating changes to the menu offered at schools between 2004 and 2006 by decreasing the amount of processed foods and increasing the amount of fruit and vegetables available at meals. It would appear that the increased availability of these foods at the school meal led to children choosing more fruit and vegetables with their school meal. In a review by Savage *et al.,* (2007) accessibility and availability of fruit and vegetables was reported to be a predictor of consumption in children who had low preferences for these foods in the home-setting and it is possible that this could also apply to the school-setting. The uptake of school meals in the control

schools was higher at baseline but this decreased in the following surveys so that under a third of children ate a school meal. This could have been related to the television series in 2005 featuring the popular celebrity chef Jamie Oliver who highlighted the poor quality of school meals offered to children.

In the intervention schools other positive changes in the eating habits of children occurred at morning break and school meal with a higher proportion drinking water at break-time and choosing fruit and salad.

The other changes that occurred in both types of schools was a reduction in fizzy drink intake; this could be a reflection on the downward trend in the household purchase of soft drinks as reported in the expenditure and food survey 'Family Food 2007' (Department for Environment and Rural Affairs, 2008).

### 6.6.1 Breakfast

The proportion of children who always ate breakfast did not change between surveys in either type of schools. The contents of what was eaten however did change as shown in Table 40, with children in the intervention schools choosing healthier breakfast choices with fewer choosing crisps and chocolate for breakfast . The proportion of children who ate breakfast at home also significantly increased in the intervention schools. In the control schools more children included fruit but this was offset by a reduction in fruit juice.

In both intervention and control schools children who thought that eating breakfast was important were more likely to eat breakfast, a finding also reported by Tapper *et al.,* (2008). Significantly more children in the intervention schools thought that eating

breakfast was very important in both the repeat and final surveys which could be a reason for the healthier choices made at breakfast by these children.

Children also indicated that breakfast was the meal where they had greatest influence on what they ate, with two thirds reporting that they chose what they ate, in all three surveys. This was similar to the study of Dickerson and Leader (1996) that reported that 76% of children aged over 11 years decided what to eat for breakfast. This could be the reason why cereal was the most popular item for breakfast as this does not require cooking skills and even young children have the dexterity to pour a bowl of cereal and milk.

The changes in eating habits at breakfast seen in the intervention schools could be attributed to the increased nutritional knowledge of the children from the intervention study. The fact that a higher proportion ate breakfast at home may have meant that they were able to choose healthier food choices.

### 6.6.2 Packed lunches

Packed lunches were more popular than school meals in all schools and at the time of the intervention negative publicity about the quality of school meals was evident and possibly contributed to poor uptake of school meals. The popularity of packed lunches could be due to the erroneous belief by parents that packed lunches are a healthier alternative but studies have shown that packed lunches do not meet the recommended dietary guidelines (Rogers *et al*., 2007, Rees *et al*., 2008). A previous study indicated that packed lunches appeared to have a slightly higher status than school meals among primary school children, with children having more control over the contents and knowing how the food had been prepared (Ludvigsen and Sharma, 2004). About 40% of children in this current

study reported choosing the contents for a packed lunch. Jebb *et al.* (2007) discussed the barriers to healthy eating within families that could determine the contents of a packed lunch and what was eaten for the evening meal. Packed lunches are influenced by social norms and peer pressure, typically packed lunches contain foods high in fat and sugar and there may be resistance to change for fear of ridicule of the child if healthier foods are included. Food is considered to be a source of family stress for many families and it is less stressful to let children select their own food choices. These may be reasons why there were few changes seen in the contents of the packed lunch but the changes that occurred were positive.

In the current study nearly half of the children reported having some control on the contents of the packed lunch and it is encouraging to note that more children in both types of schools had fruit in their packed lunch and in the intervention schools fewer children included biscuits and more children included yoghurt.

### 6.6.3 Fruit and vegetable intake

Fruit and vegetable intake increased in both types of schools as shown in Tables 45, and 46 which reflects the national trends reported in the HSE reports that show that children are eating more fruit and vegetables but that the majority of children still fail to meet the recommended intake of 5 portions of fruit and vegetables per day. A five-year study by Johnson and Hackett (2007) on the fruit and vegetable intake of 9-10 year old children also reported an upward trend in the intakes of these foods.

The majority of children in this study were aware that they should consume 5 portions of fruit and vegetables each day as assessed by their response to the nutritional knowledge

question in the questionnaire, with a higher percentage of children in the intervention schools providing the correct answer in both the repeat and final survey. This was higher than that reported by Peter *et al.* (2007) which found that only 57% of 7-10 year old children knew how much fruit should be eaten daily. In adults, evidence is emerging that knowledge is associated significantly with healthy eating (Wardle *et al.*, 2000) and in children it has been proposed that educational strategies should encompass both knowledge and opportunity to experience healthy eating e.g. tasting, for food preferences and behaviour to change (Westenhoefer, 2001, Blanchette and Brug, 2005). The distribution of free fruit at school has been shown to be effective in increasing fruit intake of 5-7 year olds but this increase is not sustained after the scheme ends (Wells and Nelson, 2006). It has been suggested that schemes should be of a longer duration to achieve sustained changes in children's diet. (Fogarty *et al*., 2007).

Increased intake of fruit and vegetables that occurred in both types of schools was reported for morning snack, school meal and packed lunches. As previously discussed the increase seen at morning break and school meal was probably due to the Borough wide changes in school policy and menus. In the intervention schools further significant changes in intake of fruit and vegetables occurred in the afternoon and at the evening meal. Although the evening meal was the meal that children had least control over food choices the proportion that included vegetables increased, resulting in few children in the intervention schools never eating vegetables with their evening meal. These changes in eating patterns could have been due to the information sheets and activities that children took home during the intervention period and the increased nutritional knowledge of the children.

### 6.6.4 Snacks

Children reported on their consumption of snacks at three occasions during the day. Changes made at the morning break resulted in increased fruit intake and a reduction in crisps and chocolate intake observed in both types of schools and as indicated earlier were probably a reflection in the changes to school policy. Significant positive changes in what was eaten for the afternoon snack occurred solely in the intervention schools with children choosing healthier snacks, fewer children eating chocolate, crisps and sweets and more eating fruit and raisins. At bedtime significant changes to what was chosen was also found with a reduction in chocolate and sweets consumption among children in the intervention schools. Eating crisps as a bedtime snack decreased in both types of schools.

The eating of snacks is possibly a time when children have more control of their food choices and the changes in what children chose for snacks could be a reflection of the message on healthier snacks covered during the intervention. One aspect that has been shown to influence children's dietary intake is the effect of advertising of food products. Most of the food items promoted to children being high in fat, salt or sugar and likely to be eaten as snacks (Food Standards Agency, 2003). The majority of the children reported watching television and would likely be influenced by the commercial brands promoted in the adverts. Decreased frequency of television viewing was reported by all children in the repeat and final surveys. This is important as increases in television viewing have been associated with increased energy intake, particularly of energy-dense, low-nutrient foods in young people (Wiecha *et al.*, 2006).

Other changes to eating habits included a reduction in daily chocolate and crisps intake. Mean daily chocolate intake was higher at baseline in the intervention schools and

decreased to a level below the control schools in the repeat and final survey. The proportion of children that ate crisps at more than one opportunity during the day decreased from over a quarter of children at baseline to around 15% in both schools in the subsequent surveys.

### 6.7 Effect of the intervention according to gender and BMI classification

Differences in eating and activity patterns of children according to gender and BMI classification were investigated to see if any category was more affected by the intervention. The potential of different effects of the intervention on boys or girls or on BMI classification could help in our understanding of the effectiveness of interventions.

Few differences in eating habits between boys and girls were found, these were mainly on fruit, crisps and chocolate intake and were seen in both types of schools. Overall girls were more likely to eat fruit and vegetables with mean daily intake higher in all three surveys; this is similar to the results of the LIDNS (Nelson *et al*., 2007) and the ALSPAC survey of 7 year old children (Glynn *et al*., 2005). Some of the differences observed at baseline were not apparent in the following surveys as fruit and vegetable intake increased in boys to a comparable level to girls. Mean daily crisp intake was higher in the baseline and repeat survey in boys whereas mean daily intake of chocolate for boys was higher in all three surveys. This is different to that reported in the LIDNS survey which reported a similar percentage of boys and girls (over 80%) consuming crisps and a higher percentage of girls consuming chocolate. Although the mean daily chocolate intake was higher in boys the overall value decreased between surveys and conversely the mean daily fruit

intake of boys increased between surveys. This implies that the nutrition aspect of the intervention was applicable to both genders.

Similarly few gender differences in activity patterns were found, these included boys being more active at playtime and participating in different PE activities to girls. Television viewing and, more particularly, playing computer games was more prevalent in boys. These findings are consistent with previous studies (Gortmaker *et al.,* 1999a). This gender difference indicates that messages to reduce television viewing and playing computer games as part of school-based physical activity programme should apply to boys.

The majority of the gender differences in eating and activity patterns occurred in both types of schools and would indicate that the intervention had similar impact on both boys and girls.

Few differences in eating and activity patterns were seen between the BMI classifications. For eating patterns all the differences were found in those children classed as either overweight or obese. These included fewer overweight/obese children eating breakfast in the baseline survey, a finding consistent with other surveys (Jefferson, 2005) and also highlighted in the review by Krebs *et al.,* 2007. O'Dea and Wilson (2006) identified a relationship between the high BMI of children from low socio-economic status and the poor nutritional quality of their breakfast. They were also less likely to eat a snack in the morning and bedtime.

In the intervention schools fewer overweight/obese children ate crisps with their packed lunch and at bedtime, a difference that was not evident in the control schools. Reporting

bias needs to be taken into consideration but there was no difference noted with other high fat/high sugar foods.

For activity patterns the only differences noted were that fewer thin and obese children enjoyed PE lessons compared to healthy weight and overweight children and that obese children were more likely to walk during playtime. No difference was observed in the participation in PE lessons between children of different BMI classifications or in their frequency of television viewing or playing computer games. This suggests that activity levels of overweight and obese children in school are not different to children of a healthy weight, but sedentary behaviours could be different as the duration of activities was not available for comparison.

The intervention appeared to apply to all weight classifications but may have decreased the intake of crisps in overweight and obese children.

### 6.8 Body shape dissatisfaction

The proportion of children who exhibited dissatisfaction with their body image in this survey was similar to other studies (Franklin *et al.,* 2006, Gualdi-Rosso *et al.,* 2008). Body shape dissatisfaction and low body esteem have been associated with higher levels of depression and low self esteem in children and adolescents and in young adolescent girls it has been postulated to be one of the factors that predict the onset of eating disorders (Robinson *et al.,* 2001). Also the body image may influence whether healthy eating behaviours are initiated.

A greater discrepancy was observed in children in the intervention schools in all surveys on body shape selected compared to actual BMI. This could not be accounted for by a

negative impact of the intervention as it was evident in the baseline survey. No difference in body shape dissatisfaction scores of boys or girls was observed between schools with just over a half of boys and fewer girls reporting to be satisfied with their body shape. In a study of children aged 11 years Robinson *et al.,* (2001) concluded that body shape dissatisfaction was evident across ethnicity and socio-economic status. Although there were a significantly higher proportion of Black children in the intervention schools at baseline this was not evident in the subsequent surveys and all schools had similar levels of deprivation. There are conflicting views about body image dissatisfaction in Black children, ranging from Black adolescent girls being more satisfied and proud of their body shape (Story *et al.,* 1995) to 80% of Black females aged 15 years wanting to be thinner (Banitt *et al.,* 2008).

A third of boys and nearly a half of girls wished to be thinner in this study with this desire starting with those of a healthy weight. It has been reported that children who wished to be thinner at a young age had a more rapid increase in weight between the ages of 3 and 8 years (Angle *et al.,* 2005). No previous information on the rate of weight gain of the children was available for this study.

### 6.9 Well-being

It is important that any intervention does no harm and there is also the need to assess preventive initiatives from children's perspectives. General questions on well-being were included in the questionnaire. It is necessary to consider that the responses to these questions using subjective indicators without context to the individual's frame of reference and circumstances might limit the validity of the responses to the day of the survey itself

or the environment that the questions were asked. To minimize this affect all children answered the questions in a similar classroom environment for each survey.

The responses of children in all three surveys were similar to the questions on verbal bullying and how you feel about yourself with only half of the children reporting that they hardly ever worried or choosing the very happy face from the pictorial scale to describe themselves.

Differences were however observed between gender and body weight classification. In all schools a significantly higher proportion of girls worried a lot about verbal bullying and an increase in those who worried a little about being made fun of was seen within the intervention schools. In the repeat survey a greater proportion of overweight and obese children in the intervention schools described themselves as unhappy whereas no change was seen in response of thin or healthy children. This could indicate that the intervention had a potential negative effect on well-being of overweight and obese children. This finding is an important consideration for future strategies. The health promotion message in this intervention deliberately did not mention diet or weight and the focus was on healthy lifestyles. Children were measured on the same day that they completed the questionnaires and were aware that this would take place and it is possible that this could have influenced their response to the question on well-being.

### 6.10 Activity

The physical activity recommendation set by the government is that children should achieve at least 60 minutes of at least moderate intensity physical activity each day

(Department of Health 2011). The proportion of children who meet this target has remained relatively stable since 2002 with 72% of boys and 63% of girls in 2007 reaching this target, with a further 15% of boys and 19% of girls meeting the low activity level of less than 30 minutes a day, (HSCIC, 2009).

The proportion of children that walked to school in both types of school was considerably higher than that reported nationally in the baseline survey. The proportion of children that walked to school was lower, and those that traveled to school by car was higher in the intervention schools than the control schools. Although these schools were from areas with similar levels of deprivation the average distance of travel to school was not determined which could have accounted for the difference.

Although the focus of the intervention was not on activity two sessions were included to increase children's self-efficacy through gaining confidence in trying alternative activities as part of a healthier lifestyle and decreasing sedentary behaviour. Intervention schools were also encouraged to promote playtime activities and provide the use of equipment which may be a reason why 'running around' decreased and 'other' activities increased. During this time the healthy school initiative was also promoting physical activity with playground supervisors. This may have been why a similar result was also seen in the control schools.

A wide range of activities was provided by schools with football and swimming being the most popular activities. It is known that nationally the number of children who participated in two hours of school sports increased from 69% in 2004/05 to 80% in 2005/06 (DCFS, 2008 School Sports Survey).

The proportion of children who watched TV every day decreased in all schools, and in the intervention schools a reduction in those that played computer games every day was also seen. This is an encouraging finding as it has been reported that the amount of time spent by British children in front of the television or computer has increased over the last five years (Childwise 2008)

### 6.11 Overall evaluation of the intervention

In the surveys changes to eating habits of children were observed at both meals and snacks which reflected the focus of the intervention, particularly in the reduction of high- fat, high-sugar foods and an increase in fruit and vegetables. Some of these changes occurred in both types of schools and were probably due to policy changes and also reflected the national trend in consumption. Other changes in eating habits occurred only in the intervention schools, these were mainly seen in changes to what was eaten for breakfast and snacks.

In the long term the modest impact of the intervention was on food choices for breakfast and the consumption of healthier snacks. The results of the intervention using the PRECEDE-PROCEDE planning model and the selected SCT concepts were similar to other studies utilizing SCT which have been modestly successful in increasing fruit and vegetable intake among children (Gaines and Turner, 2009).

### 6.12 Prevalence of childhood obesity in Bexley

The Chief Medical Officer UK annual report of 2002 highlighted obesity as ‘the health-time bomb’ and reported that between 1996 and 2001 the proportion of obese children

aged 6-15 years rose by 3.5% and the proportion of overweight by 7% (DH, 2003a). Whilst it was known that the national prevalence of childhood obesity was increasing, with 31.6% of boys and 30.9% of girls aged 2-15 years either overweight or obese in 2002 (DH, 2003b), there was limited information on local and regional variation which is essential for planning at local level.

In 2002 estimates of the level of childhood obesity in Bexley were based on extrapolations from national data. For Bexley they indicated that there could potentially be over 3,500 overweight and 3,500-4,500 obese children aged 5-13 years in the borough.

The use of BMI z scores (or standard deviation scores) allows standardization of data for age and sex and enables comparisons to be made between groups. In this study BMI z scores were calculated for children in the baseline and repeat surveys and compared to the WHO standard reference 2007. This showed that the proportion of children with a z score above +1SD (overweight) and +2SD (obese) were much higher than the reference values in both surveys and around 3% of the children had z scores above 3SD.The mean z score was 0.58 at baseline and 0.51 in the repeat survey.

Using the UK BMI cut off points to classify children as overweight or obese the prevalence of overweight (including obesity) for all children (ages 9-11 years) in the current study were comparable to the national level reported in the HSE reports for children aged 2-15 years for the corresponding years, (Bexley 33.8% in baseline survey of 2004, national 34%; Bexley 30.5% in repeat survey of 2005, national 32.6%) sourced from the HSE 2007 report (HSCIC, 2008a). The difference in the proportion of children

overweight and obese in the Bexley sample was within 2% of the HSE results, with slightly fewer overweight children in the Bexley sample for both 2004 and 2005, and a slightly higher proportion of obese children in 2004.

The prevalence of overweight and obesity for all children reported in the HSE reports are provided occasionally as 2-year age groups (HSCIC, 2006) or more commonly as three age- bands (HSCIC, 2007), these being 2-10 years, 11-15 years and 2-15 years. The ages of the children in the current study, (9, 10 and 11 years) crossed these age bands, therefore comparisons were made with the wider 2-15 year band for the same time period. Levels of obesity in the 11-15 year band were considerably higher than the younger 2-10 year band whereas the prevalence of overweight was similar for all ages.

When prevalence of obesity in Bexley children for 2004 were compared with the aggregated national data of 2002-2004 (HSCIC, 2006) it was found that obesity levels were within the range reported for children aged 8-10 years and 11-12 years (Bexley 20.9%, 8-10 years 18.7%, 11-12years 22%).

Children were not measured in the final survey because as a result of government legislation children in both reception year (ages 4-5) and year 6 (ages 10-11) were to be measured annually in schools during the school year starting 2005-2006. As this included most of the children in the survey and access was available to the data it was decided to use the measurements from the national child measurement programme (NCMP) as a local comparison to the results obtained from the earlier surveys of the current study. Nearly 90% of all year 6 children in Bexley schools were measured in 2006 and the results

showed that 13.6% of children were overweight and 17% obese (NCMP 2005-06 local data report).

The proportion of children measured in Bexley who were overweight for both surveys in this study and the local NCMP results for year 6 children was very similar (12.9 – 13.6%), whereas the proportion of children who were obese was higher in the baseline survey in 2004, compared to the repeat (2005) survey and NCMP survey in 2006, (20.9%, 17.5% and 17.0% respectively).

The prevalence of obesity found in the current study was probably an underestimate owing to several factors. Firstly the prevalence of overweight and obesity may have been affected by the fact that not all children were measured due to the requirement for parental consent and the varying response rate between schools. The average response rate for the baseline survey in 2004 was 83% with 536 children measured; this was considerably less in the repeat survey with measurements of only 285 children available for comparison. Secondly it was also observed during the recording period that some apparently obese children had not taken part in the survey.

Levels of childhood obesity have been linked with socio-economic variables; in the HSE report of 2007 (HSCIC, 2008a) obesity was seen to increase with index of multiple deprivation (IMD) for boys and girls, being highest in children from the most deprived quintile (IMD 5) and lowest in children from the least deprived quintile (IMD 1) (19.3% compared to 13.8%). Also, for girls, obesity and overweight prevalence was highest in the lowest income group. This was corroborated by analysis of the NCMP data for 2007-08

which showed that children from the most deprived areas had higher risk of obesity. This association with social deprivation has been reported in young children (Armstrong *et al*., 2003).

The higher level of obesity in the baseline survey (20.9%) compared to the NCMP results for the whole borough (17%) may be a reflection of the higher level of deprivation in the study area. Although this association was not evident in the repeat survey this could be due to the small number of children measured. Details for the Bexley NCMP results for 2006 indicated that schools included in the current study sample had the highest levels of children at risk of obesity in year 6 (Bexley Public Health, personal communication).

The proportion of children within the healthy weight range decreased with increasing age in both baseline and repeat surveys, with a corresponding increase in the proportion of children who were obese. This supports previous reports on childhood obesity which have reported increases in obesity with age, with the most marked increase being in the 8-10 year group which persists into adolescence (Jotangia *et al.*, 2005, Rudolf *et al*., 2006).

No statistically significant difference was observed in the prevalence of overweight or obesity between boys and girls in the current study. Differences in the prevalence of overweight and obesity between boys and girls in the UK have varied over the years in the HSE reports. In 2006 boys were more likely to be overweight or obese compared to girls but in 2002, 2005 and 2007 no significant differences were observed in obesity prevalence between boys and girls (HSCIC, 2008). A review of international obesity rates by Sweeting, (2008) also reported that the differences between boys and girls are generally

small and at present neither boys or girls consistently predominate within a particular age group, however it suggested that estimates for both males and females are always presented.

Mean BMI of boys increased with age in both baseline and repeat surveys (Table ), for girls this increase with age was only observed in the baseline survey (Table ). Mean BMI was higher in the baseline survey compared to the repeat survey for boys aged 9 and 10 years and girls aged 9 and 11years. This could be a reflection of the trend reported in the HSE surveys that found that between 1995 and 2004 mean BMI of both boys and girls increased but between 2004 and 2007 it had reduced to levels similar to those seen in 2001 (HSCIC, 2009).

In this study the mean BMI for both boys and girls was at or above the 75$^{th}$ centile of the reference population for all ages. This is higher than that reported in the analysis of the 2007/08 NCMP data which found that for children in year 6 (ages 10 -11) the mean BMI for boys equated to the 69$^{th}$ centile and girls to the 66$^{th}$ centile (National Obesity Observatory, 2009).

Mean BMI was higher in girls for all ages in the baseline survey and for ages 9 and 10 in the repeat survey, the differences varied from 0.2 -1.1 kg/m$^2$. Boys had a higher BMI in the repeat survey at age 11 (a difference of 0.3kg/m$^2$). This difference between boys and girls was similar to those reported in the HSE 2007 with mean BMI higher among girls.

Although only a small proportion of the children were from a Black ethnic group in this study (9 – 22%), this group had the highest percentage of children in the overweight and

obese categories in both surveys. This is similar to findings from the HSE reports and the NCMP data which reported that overweight (including obesity) prevalence was markedly higher among Black African or Black Caribbean children than the general population. Other studies in the UK have found the highest rates of obesity among Black girls (Saxena *et al.,* 2004, Wardle *et al.,* 2006, Harding *et al*., 2006). Due to the small sample size in this study it was not possible to further subdivide the ethnic background according to gender but it was seen that the highest mean weight and height was found in Black girls. Children from the Asian group had the highest incidence of obesity in the current study but the subject numbers were too few to be meaningful, Wardle *et al.* (2006) found that Asian boys had the highest overweight and obesity rates in their five year longitudinal study of 11-12 year olds.

It has been suggested that the link between obesity and ethnicity may be confounded by the body composition of Black children, in particular height, and further investigations are needed (National Obesity Observatory, 2009).

In summary, the prevalence of overweight (including obesity) of children measured in the current study was comparable to national data with one third either overweight or obese. The proportion of obese children was higher in the baseline survey (2004) than national data for the same year and the Bexley NCMP results for 2005/06. This higher incidence could be a reflection on the level of deprivation of the study area which was not replicated in the repeat survey because of the low participation rate. In both surveys the proportion of children within the healthy weight range decreased with age. There was no difference in the prevalence of overweight or obesity between boys and girls but the highest prevalence

of obesity was found in Black children. Mean BMI was more likely to be higher in girls and for both boys and girls mean BMI was at or above the 75$^{th}$ centile of the UK 1990 reference. No significant difference was found between the intervention and control schools at either survey.

The estimated number of overweight children aged 5-13 years in Bexley derived from national data were similar to that based on the study results but the number of obese children were underestimated with potentially 750-1000 further obese children in Bexley.

# CHAPTER 7

# CONCLUSION

## 7.0 Conclusion

The tailored school-based intervention appeared to have a modest impact on the food choices for breakfast and the consumption of healthier snacks in children aged 9-11 years.

The intervention appeared to have comparable impact on both boys and girls and all weight categories. Few differences were noted between gender in eating and activity patterns. Girls were found to have a higher mean daily intake of fruit and boys a higher mean daily intake of crisps and chocolate in both types of schools. Playing computer games was more prevalent in boys. For future interventions messages to reduce sedentary behaviour should specifically apply to boys. Activity levels in schools were not noticeably different between weight categories but differences in sedentary behaviour could not be dismissed as duration of activities was not available.

Previous studies have reported a range of psychological problems in overweight and obese children. This study found that around half of all children irrespective of weight worried about ‘being called names’ or ‘made fun of’ with girls more likely to be worried about verbal bullying. Around half of the children described themselves as very happy and fewer than 5% described themselves as very unhappy. Overweight and obese children were more likely to describe themselves as unhappy compared to healthy weight or thin children. In the repeat survey a greater proportion of overweight and obese children in the intervention schools described themselves as unhappy. This is an important consideration for future strategies involving school-based obesity prevention programmes: it is essential to measure the impact on wellbeing.

This study provides further information on the degree of body shape dissatisfaction apparent in primary school children. Overall both boys and girls indicated that they wanted to be thinner, a finding similar to other studies, whereas earlier studies had found that boys of this age had a desire to be heavier. Boys in the current study were more accurate at estimating their body shapes at the lower end of the scale compared to girls but overweight and obese boys and girls tended to underestimate their shape. Boys and girls exhibited body shape dissatisfaction in all three surveys with a third of boys and over 40% of girls indicating they wanted to be thinner than their perceived shape, with a similar proportion of boys and girls (around 10-14%) wanting to be heavier. Girls were more likely to be dissatisfied with their shape for all body shapes and obese children had the highest level of body dissatisfaction.

The questionnaire developed to assess the eating and activity patterns of school-aged children in Bexley was deemed to provide reliable information when compared to other questionnaires used with children of a comparable age. Children in this study were found to be less likely to eat fruit and vegetables and always eat breakfast, but were more likely to walk to school than found in other studies.

Process evaluation on the implementation of the curriculum-based aspect of the **Be healthy** intervention programme with 350 children in four schools over a six month period was broadly successful with positive feedback from the schools. However some of the extra-curricular aspects were less successfully implemented. To maximize effectiveness of behaviour change interventions in children who have limited autonomy it

is necessary to involve parents or carers and schools and it is suggested that future programmes should include greater parental involvement. To facilitate direct contact with parents studies could incorporate child and parent events e.g. cookery sessions and regular presence at school e.g. sessions held at the beginning and end of the school day.

The outcome measures of the study changes to eating habits were observed for both meals and snacks and reflected the focus of the intervention with a reduction of high-fat, high-sugar foods and increased fruit and vegetable intakes. Most of the changes in diet that occurred in all schools reflected changes in school policies. Changes that occurred only in the intervention schools were in children's choices for breakfast and snacks where children may have more control over their food choices.

The impact of the **Be healthy** intervention may have been lessened by the concurrent television series highlighting the poor quality of school meals hosted by a popular celebrity chef. Also many schools had been or were recruiting to the healthy schools programme during the period of the study and a local school meal advisory group was attempting to improve the school meals. These external factors would have impacted on all schools in the study and appear to have influenced children's intake at school meals and morning snacks.

This study provided local information on the prevalence of obesity in 9-11 year old children which was necessary for planning at local level. The results revealed that a third of the children measured were either overweight or obese which was comparable with

national data. The prevalence of obesity in this study was probably an underestimation as it was observed that some apparently obese children had opted out of the survey. The proportion of obese children was higher in the baseline study (2004) than national data for the same year; this could have been a reflection on the level of deprivation in the study area. This higher incidence of obesity was not replicated in the repeat survey possibly due to the lower participation rate. These results indicated that the number of obese children in Bexley was likely to be higher than originally estimated from national data. Mean BMI was at or above the 75$^{th}$ centile of the UK 1990 reference for both boys and girls.

## 7.1 Limitations of the study

Action research projects are particularly subject to limitations associated with the constraints of the study environment and a number of aspects are worth special mention.

### *Assessment of eating habits and physical activity*

The assessment of eating habits and physical activity in children is difficult with few validated tools. The questionnaire used in this study was based on self reported behaviour and no quantitative evidence on the changes in eating habits or activity patterns was available to corroborate the reports. One method of validating the reports would have been to make direct observation of intake or activity for comparison. Due to constraints of the study this was not possible but the reliability of the questionnaire was established by comparison with other assessments of children of a similar age group. For example the contents of the packed lunches in this survey were consistent with studies commissioned by the Food Standards Agency.

Under-reporting of food intake has been reported in overweight children. This could possibly be a reason why few differences were observed in the eating patterns of children according to BMI classification.

The impact of the intervention was determined in part by reported behaviour changes. It is possible that the responses indicated a 'desirability effect', the children in the intervention schools may have become more aware of what they should be doing and what answers were wanted as a result of the intervention and responded accordingly. There is no evidence of this; for example - similar responses were reported by children in both schools when changes were made to the school menu which increased the range of food choices available.

***Evaluation strategy***

The design of evaluations should contain options for measuring process, impact and outcomes with the aim to improve learning or improvement. The choice of model or theory used in planning an intervention is also essential for evaluation purposes. Alternatives to the current study would have been to conduct a cohort study or time-series study. The advantages of a cohort study involving identifying a group who are followed over time include its prospective nature and the ability to investigate multiple outcomes. The disadvantages include subjects that are lost during follow up may have different characteristics to those that complete the study and cohort studies are expensive to conduct.

This study was planned as a series of cross sectional surveys. It was not the same cohort of children in each round of surveys. In order to make the findings more robust, the data on children who could participate in two consecutive surveys was examined as a more powerful indicator of the impact of the intervention.

The duration of the study may not have been adequate to see any significant trends. To determine long term impact of behaviour changes suggest future research be a two to three year longitudinal study.

***Participants***

It was not possible to carry out a RCT in this sort of project, participants in the study were not random and a number of factors may have influenced participation and led to bias in results. It was observed during the weighing and measuring that parents of some apparently obese children had opted out of the survey.

The participation rate in the study varied between surveys. Written (opt-in) consent was required for both the baseline and repeat survey. At baseline the high participation rate was obtained partly by the high involvement of the school staff which was not as evident in the repeat survey. Written consent was not necessary for the final survey which resulted in a greater participation rate.

***Other initiatives and confounding factors***

During the duration of the study children's behaviour was influenced by factors beyond the control of the study. Any messages on healthy eating delivered in the school setting were recorded but influences outsider the school setting were more difficult to assess. The effects of these influences were deemed to apply to all children.

The importance of environmental determinants on nutrition behaviour was demonstrated in the final survey when borough wide alterations to the school menu included additional food choices.

There was limited parental involvement in this study. The opinions of parents were solicited at the beginning of the study on the proposed subject area of the project. Attendance at school events prior to the project may have facilitated a better response from parents.

## 7.2 Future research

This study adds to the limited information available on the eating and activity patterns of 9-11 year old children and highlights the need for improved methods of assessing the diets of children and young people. Computer literate children are potentially more likely to record activity and intake using hand held devices such as mobile phones or netbooks, the cost of these instruments should not be a barrier to their use (Boushey et al., 2009).

Process evaluation on the implementation of the curriculum-based aspect of the programme was successful but to maximise the effectiveness of such programmes greater parental involvement and consideration of environmental determinants should be an integral part of any future programme. Research with parents in the design and evaluation of future studies based on data from children should be considered.

Sedentary behaviour was more apparent in boys and future research should consider ways of reaching this target audience.

Future research on school based interventions should incorporate messages on positive body image and self esteem and actively include children's views in how these should be developed. In this study body shape dissatisfaction was apparent in boys and girls with a healthy weight, half of children irrespective of weight were worried about verbal bullying and overweight and obese children were more likely to describe themselves as very unhappy. The impact on wellbeing should be measured as an integral component of any programme with age appropriate tools to monitor any potential negative impact or unwanted side effects of any programme need to be developed.

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# APPENDIX 1

# INFORMATION LETTERS
# ABOUT PROPOSED STUDY

KING'S College LONDON

University of London

Dear

I am writing to seek your school's help with a research project aimed at developing prevention strategies for children who are at risk of becoming obese.

The prevalence of childhood obesity in the UK is increasing; current research reports that 22-24% of children are overweight and 9-17% are obese. If these figures were extrapolated to Bexley it would mean that there could potentially be over 5,500 overweight and 2,200-2,400 obese children aged 5-13 years in the borough.

In response to the government call for action, Bexley Children's Fund Programme has funded a research project on the prevention of childhood obesity in Bexley. For this to be effective we need to know the factors influencing the diet and activity patterns of local children. Although school based programmes have shown some success in reducing obesity in children, there is a need to explore intervention strategies that would work in Bexley. I am a State Registered Dietitian based at Queen Mary's Hospital, Sidcup and have been appointed to undertake this project over the next two years in conjunction with King's College London.

This is a preliminary inquiry to see whether it might be possible for children in years 5 and 6 at your school to participate in this project. Initially the study will involve completing a short questionnaire on diet and activity patterns and having confidential measurements taken of weight and height, I anticipate this would take place towards the end of January/ beginning of February 2004.

This project will be submitted for ethical approval. The measurements and questionnaire used will be subject to approval by the Chief Education Officer of Bexley. Schools that participate in this project will receive feedback of the results obtained.

I hope that it will be possible for you to consider participating in this study. I would be happy to visit you to discuss this in more detail if this would be helpful.

I look forward to hearing from you,

Yours sincerely,

Gwenda Scott
Paediatric Research Dietitian

**Be**xley, **h**ealthy **e**ating, **a**ctive **l**ifestyle by **t**eaching **h**ealth for **y**oungsters

**Be healthy programme**

**What will this mean to your school?**

- **Curriculum based activities**

**Resources** –
**Eat 2b fit**: a teaching resource for primary schools, produced by the British Dietetic Association (BDA). This consists of teaching notes, ideas for classroom activities to assist in teaching nutrition at key stages 1 and 2.
**Nutrition Mission**: a CD-ROM produced by the British Heart Foundation (BHF) teaching children about healthy balanced diets.
**Let's get physical**: a booklet produced by the BHF suggesting ways of being more active.

Short training session will be offered to classroom teachers to discuss which lesson plans and activities to be recommended over the three half terms the project will be running.

- **Extra curricular activities**

**Playtime**
- Playground activities

Providing hoops, skipping ropes etc to encourage all children to be active during playtimes.
- Snacks

Promoting a school policy on healthy snacks together with a proposal of starting a fruit tuck shop during playtime, offering a small selection of fruits at a fixed price.

**Breakfast club**
Consider starting a breakfast club with the aim to support children's education and improve health and nutrition.
If a breakfast club already in operation, promote healthy food choices.

**Lunch**
- Promote healthier choice by displaying posters on fruit and vegetables in canteen.(provided by project)
- Increase quantity of fruit and vegetables available for children eating the school dinner.

**Campaigns to promote Be healthy message**
- Leaflets /posters activity sheets to be provided together with input from dietitian to parents (if parents request session from questionnaire)
- Session on healthy eating / eat more fruit and vegetables. ( all resources and fruit tasting etc to be provided by project)

**Be**xley, **h**ealthy **e**ating, **a**ctive **l**ifestyle by **t**eaching **h**ealth for **y**oungsters

Your child's school has agreed to be part of the **Be healthy** project.

This project encourages a healthy lifestyle for your children by giving pupils consistent messages about health throughout the whole school, in lessons, playtimes and school meals.
We would welcome your views on what might be included as part of this programme and ask that you complete this short questionnaire.

Thank you.

---

We would be grateful if you could circle your answer for the following statements and return to the school.

1. I / we would support a school policy on healthier break time snacks. Agree. Do not agree.

2. A breakfast club at school is a good idea. Agree. Do not agree.

3. Games, skipping ropes, hoops should be made available at playtimes. Agree. Do not agree.

4. More fruit and vegetables should be made available for school lunches. Agree. Do not agree.

5. A session on lunchbox ideas for parents would be useful. Agree. Do not agree.

6. Materials on healthy eating for children would be useful. Agree. Do not agree.

7. Fun physical activity ideas for children would be useful. Agree. Do not agree.

**Responses of parent questionnaire**

Parents of children chosen to be part of the intervention were sent letters to inform them of the schools decision to be part of the **Be healthy** project and a summary of the aims of the project. Their views on what might be included in the programme were sought by means of a questionnaire. They were asked to indicate whether they agreed or disagreed to seven statements on aspects of the project and their responses are shown below.

**Responses of parents in the intervention schools to questionnaire on their views on what might be included in the Be healthy programme**

| | School 2 | | School 3 | | School 8 | | School 10 | |
|---|---|---|---|---|---|---|---|---|
| Response rate % n | 18.3% (11/60) | | 43.3% (26/60) | | 40.6% (65/160) | | 3% (2/60) | |
| Statements * | A % (n) | D % (n) | A % (n) | D % (n) | A % (n) | D % (n) | A % (n) | D % (n) |
| 1. support policy on healthier break time snacks | 91 (10) | 9 (1) | 100 (26) | | 95 (62) | 5 (3) | 50 (1) | 50 (1) |
| 2. breakfast club at school a good idea | 100 (11) | | 85 (22) | 15 (4) | 85 (55) | 15 (10) | 100 (2) | |
| 3. provision of playtime materials | 100 (11) | | 96 (25) | 4 (1) | 100 (65) | | 100 (2) | |
| 4. more fruit and vegetables available for school lunch | 91 (10) | 9 (1) | 100 (26) | | 94 (61) | 6 (4) | 100 (4) | |
| 5. session on lunchbox ideas for parents useful | 73 (8) | 17 (3) | 65 (17) | 35 (9) | 58 (38) | 42 (27) | 50 (1) | 50 (1) |
| 6. materials on healthy eating for children useful | 91 (10) | 9 (1) | 88 (23) | 8 (3) | 80 (52) | 20 (13) | 100 (2) | |
| 7.fun physical activity ideas for children useful | 100 (11) | | 100 (26) | | 97 (63) | 3 (2) | 50 (1) | 50 (1) |

*A(Agree), D (Disagree)

One school had a very poor response rate (3%) and the responses were not included. Over 80% of parents agreed with all statements apart from statement 5 which asked if lunch box sessions to parents would be useful, responses to this statement varied between 58-73%. Over half of the parents agreed with all statements, it was decided to include all aspects in the project either as part of the curriculum or as extra curricular activities.

# *Information letter to parents*

***Project***

The identification of the risk of obesity among Bexley schoolchildren.

***What is the purpose of this project?***

This project will promote healthy lifestyles for children. The number of children who are overweight or obese in this country is increasing but as yet we know very little about what is happening in Bexley. All children in years 5 and 6 of your school have been invited to take part in a project to find out what children in Bexley are eating and their activity.

**What will happen if my child takes part?**

A dietitian will visit your child's school and your child will be asked to fill in a questionnaire during school time.

The questionnaire will be divided into 3 parts:

Section 1 will ask what your child eats
Section 2 asks about how active they are
Section 3 asks about how they would describe themselves

Each child will be weighed and their height measured to see how fast they are growing, which will help us to identify and plan programmes that may be of help to your child.

***What are the possible benefits and disadvantages?***

All children will be weighed and measured individually and not as a group. All information about your child will remain confidential. General information will be provided to the school so that it can be used in food related activities in schools to benefit all the children.

***Does my child have to take part?***

The questionnaires have been designed to give us the information we require and stimulate discussion on foods. We very much hope you will agree to your child taking part. If you decide to take part you are still free to withdraw your child from the project at any time.

Name of investigator: Gwenda Scott

**Title: Senior Dietitian**

Address: Queen Mary's Hospital, Sidcup, Kent, DA14 6LT
Phone:020 8302 2678
Bexley&Greenwich Research Ethics Committee REC reference number: BGREC/06/JAN/04

**CONSENT FORM**

**Title of Project:** Identification of the risk of obesity among Bexley schoolchildren.

**Investigator**: Gwenda Scott. Senior Dietitian

***Queen Mary's Hospital, Sidcup, Kent. DA14 6LT***

1. I confirm that I have read the information letter to parents.

2. I understand that my child is free to withdraw from the study at any time without giving a reason.

3. I agree for my child to take part in this project. ☐

4. I do not agree for my child to take part in this project. ☐

5. I understand if I do not return this letter it will be accepted that I agree to my child taking part in this project

Please tick one of the boxes

Signed_____ Date_____

Name(in block letters)_____

Please return this form to school within 3 days of receiving it.

# APPENDIX 2

# QUESTIONNAIRE

**Appendix 2**

Number _____

Year 5 / Year 6

# Diet and Activity Questionnaire

## Children aged 9-11 years

Thank you for taking part in this questionnaire.

For most of the questions you will only need to tick the boxes to give your answer. A few questions will ask you to write in the answer yourself.

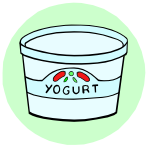
The questions are split into 3 parts.

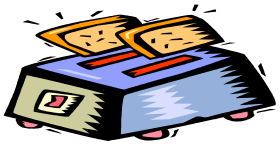
Questions in part 1 are about what you eat during the day.
Questions in part 2 are about what you do during the day.
Questions in part 3 are about you.

**Section 1**

This section tells us what you normally eat during the day.
Please answer the questions by ticking the correct box or boxes.

**1**. Are you vegetarian yes [_] no [_]
**2**. Are you following a diet for medical reasons? yes [_] no [_]
If your answer was yes please write in the type of diet _____





## *Breakfast*

**3**. Do you have anything to eat or drink before starting school?
yes [_] no [_] sometimes [_]
If your answer was no go to question **7**

**4**. Where would you eat or drink this?

| | every day | sometimes | never |
|---|---|---|---|
| On the way to school | | | |
| Breakfast club | | | |
| At home | | | |
| Somewhere else | | | |

**5**. If you do have something to eat or drink how often would you choose?

| | every day | sometimes | never |
|---|---|---|---|
| Breakfast cereal | | | |
| Toast | | | |
| Bacon | | | |
| Egg | | | |
| Cake | | | |
| Yoghurt | | | |
| Chocolate | | | |
| Fruit | | | |
| Crisps | | | |
| Glass milk | | | |
| Fizzy drink | | | |
| Fruit juice | | | |
| Something else | | | |

**6**. Who chooses what you have to eat or drink?

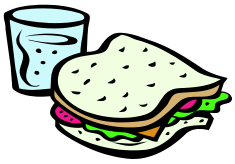
you [_] Mum or Dad [_] someone else [_]

**Morning break**

**7**. Do you have something to eat or drink at morning playtime?
yes [_] no [_] sometimes [_]

**8**. If you do have something to eat or drink how often would you choose?

| | Every day | sometimes | never |
|---|---|---|---|
| milk | | | |
| water | | | |
| Fruit juice | | | |
| chocolate | | | |
| sweets | | | |
| fruit | | | |
| crisps | | | |
| cake | | | |
| yoghurt | | | |
| Raisins/dried fruit | | | |
| Something else | | | |




**Mid day**

**9.** Do you bring a packed lunch to school [_]
or do you have the school dinner [_] go to question **12**
or do you go home for you lunch [_]

**10**. If you bring a packed lunch tick the foods that you would eat

| | every day | sometimes | never |
|---|---|---|---|
| Sandwich/roll | | | |
| crisps | | | |
| sausage roll | | | |
| biscuit | | | |
| yoghurt | | | |
| jelly | | | |
| fruit | | | |
| salad | | | |
| crackers | | | |
| cheese | | | |
| something else | | | |

**11**. Who decides what you have for your packed lunch?
**You [_] mum or dad [_] someone else [_]**

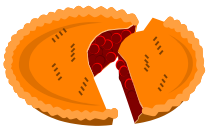
12**. If you have the school dinner do you choose ?**

| | Every day | sometimes | never |
|---|---|---|---|
| A main course | | | |
| potatoes | | | |
| rice | | | |
| bread | | | |
| pasta | | | |
| salad | | | |
| vegetables | | | |
| fruit | | | |
| Pudding | | | |

**13**. What would you drink with your lunch?

Milk [_] water [_] squash [_] fruit juice [_] fizzy drink [_] nothing [_]

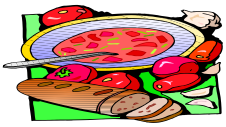
**Afternoon**



**14**. Do you have anything to eat after school before your evening meal?
Yes [_] no [_] sometimes [_]

**15**. If you do have a snack tick the one you would eat

| | Every day | sometimes | never |
|---|---|---|---|
| chocolate | | | |
| sweets | | | |
| fruit | | | |
| crisps | | | |
| cake | | | |
| sandwich | | | |
| yoghurt | | | |
| Raisins/dried fruit | | | |
| Something else | | | |


**Evening meal**

**16**. Do you have an evening meal after school?

yes [_] no [_] sometimes [_]

**17**. How often would you eat the following foods as part of your meal?

| | every night | some meals | never |
|---|---|---|---|
| Pies | | | |
| burgers | | | |
| pizza | | | |
| fried chicken | | | |
| curry | | | |
| sausages | | | |
| chinese | | | |
| chips | | | |
| potato(boiled or mash) | | | |
| bread | | | |
| chapatti | | | |
| rice | | | |
| pasta | | | |
| vegetables | | | |
| fruit | | | |

**18.** Who decides what you have for your evening meal?

you [_] mum or dad [_] someone else [_]

**Bedtime**

**19**. Do you have anything to eat during the evening after your meal?

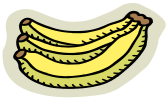
Yes [_] no [_] sometimes [_]

**20**. If you do have something tick the one you would eat

| | Every day | sometimes | never |
|---|---|---|---|
| chocolate | | | |
| sweets | | | |
| fruit | | | |
| crisps | | | |
| cake | | | |
| sandwich | | | |
| Milky drink | | | |
| Raisins/dried fruit | | | |
| Something else | | | |

**Fruit**

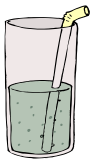




**21.** How often do you eat fruit?
Every day [_] most days [_] some days [_] hardly ever [_] never [_]

**Drinks**






**22**. Which of these drinks would you have every day?

Milk [_] water [_] squash [_] fizzy drink [_] fruit juice [_] tea or coffee [_]

**23**. If you drink fizzy drinks do you have diet types?
Always [_] sometimes [_] never [_]

**Favourite meal**

**24**. Please write in your favourite meal

| |
|---|
| |

**General information**

**25.** How many portions of fruit and vegetables do you think you should eat every day. [ ]

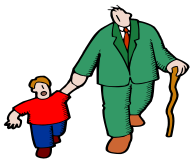
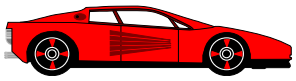
**26.** Do you think eating breakfast is
Very important [_] important [_] quite important [_] not important at all [_]

**27.** Tick which foods you think are the healthiest snacks from this list

Chocolate [_] Banana [_] Biscuits [_] Breadsticks [_] Crisps [_]
Yoghurt [_] Cake [_] sweets [_]

**Section 2**
This section tells us what you do during the day.
Please answer the questions by ticking the correct box.

**1.** How do you get to school?


Walk [_] car [_] cycle [_] bus [_] other [_]

**2**. What do you normally do during your break times at school?
Sit down [_] stand [_] walk [_] run around [_] other [_]

**3**. Do you enjoy PE at school?
Yes [_] no [_] depends [_]

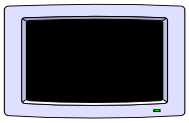
**4**. Which of these activities do you take part in at school? Tick as many boxes as you like.
Gymnastics [_] netball [_] football [_] rounders [_] cricket [_] rugby [_]
swimming [_] basketball [_] none [_] other sport not on list [_]




**5**. How do you travel home from school?
Walk [_] car [_] cycle [_] bus [_] other [_]

**6**. List any after school activities that you do?
_____
_____

**7**. Do you watch TV when you get home?
Every day [_] Most days [_] some days [_] never [_]




**8**. Do you play computer games at home?
Every day [_] most days [_] some days [_] never [_]

Section 3

This section tells us a little about yourself and how you feel.
Please answer the questions by ticking the correct box.

**1**. Your age 9 [_] 10 [_] 11 [_] **2**. Boy [_] or Girl [_]
When is your birthday?_____

**3**. How you would describe yourself

White [_]
Black [_]
Black African [_]
Black Caribbean [_]
Other [_]

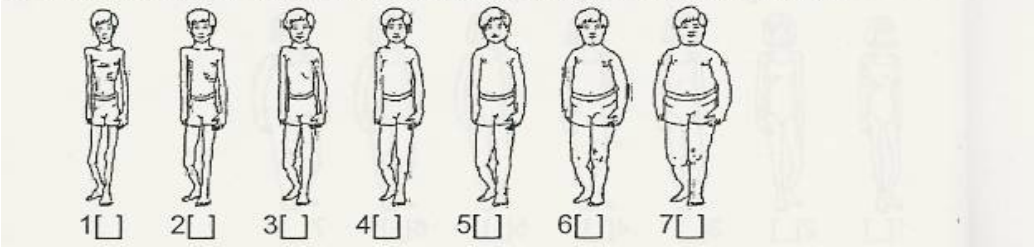
Asian [_]
Bangladeshi [_]
Indian [_]
Pakistani [_]
Chinese [_]

It is normal to worry about some things sometimes.
Please tick the box that best describes how you feel most of the time about the following things.

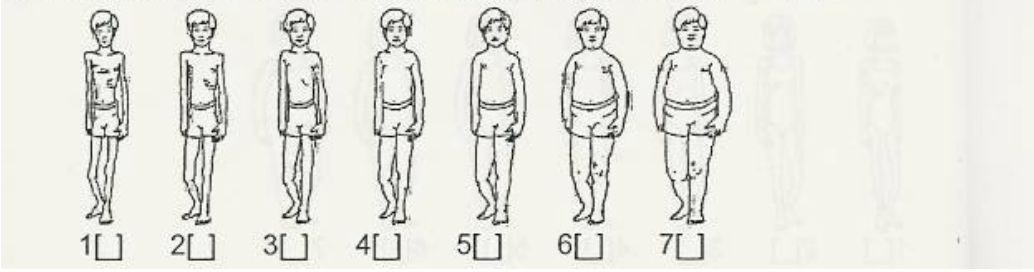
**4**. Other children making fun of me.
worries me a lot [_] worries me a little [_] hardly ever worries me [_]

**5**. Being called names.
worries me a lot [_] worries me a little [_] hardly ever worries me [_]

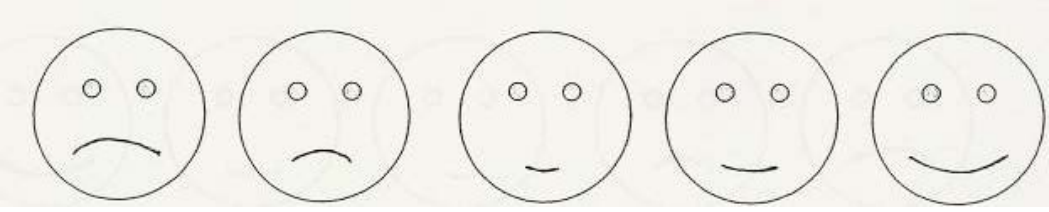
**6**. Tick the drawing with the body shape that looks the most like you.




**7**. Tick the drawing with the body shape that you would most like to look like.




**8**. Which of these faces best describes how you feel about yourself ?



Section 3

This section tells us a little about yourself and how you feel.
Please answer the questions by ticking the correct box.

**1**. Your age 9 [_] 10 [_] 11 [_] **2**. Boy [_] or Girl [_]
When is your birthday?_____

**3**. How you would describe yourself

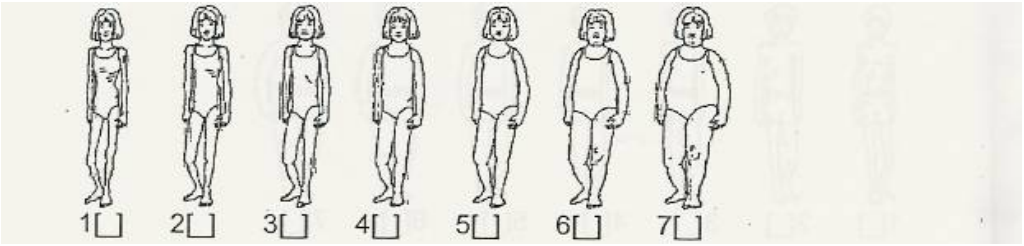
White [_]
Black [_]
Black African [_]
Black Caribbean [_]
Other [_]
Asian [_]
Bangladeshi [_]
Indian [_]
Pakistani [_]
Chinese [_]

It is normal to worry about some things sometimes.
Please tick the box that best describes how you feel most of the time about the following things.

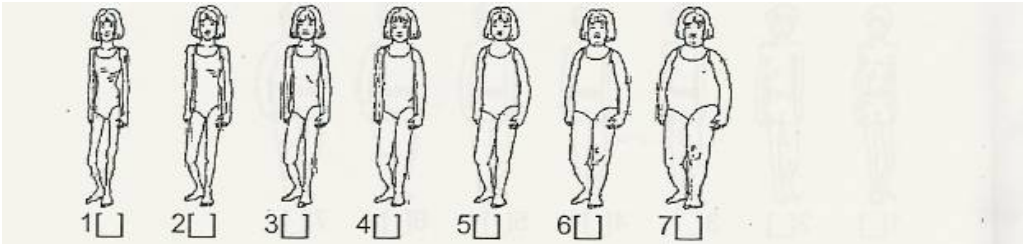
**4**. Other children making fun of me.
worries me a lot [_] worries me a little [_] hardly ever worries me [_]

**5**. Being called names.
worries me a lot [_] worries me a little [_] hardly ever worries me [_]

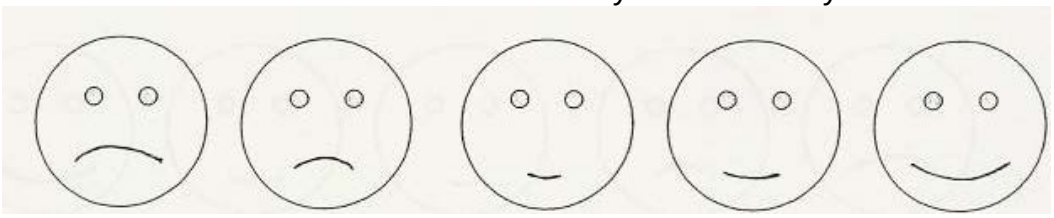
**6**. Tick the drawing with the body shape that looks the most like you.




**7**. Tick the drawing with the body shape that you would most like to look like.




**8**. Which of these faces best describes how you feel about yourself ?



# APPENDIX 3

# RESULTS OF THE BASELINE SURVEY

# Appendix 3

**Results of the baseline survey on the eating and activity patterns of children in the intervention and control schools**

## Eating habits

### Proportion of children who ate breakfast

| | Intervention schools | | | | Control schools | | | | P |
|---|---|---|---|---|---|---|---|---|---|
| | Yes | No | Sometimes | Total n | Yes | No | Sometimes | Total n | |
| Eat breakfast | 66.2% (200) | 3.0% (9) | 30.8% (93) | 302 | 68.9% (226) | 3.4% (11) | 27.7% (91) | 328 | |

### Where children ate breakfast

| | Intervention schools | | | | Control schools | | | | P |
|---|---|---|---|---|---|---|---|---|---|
| | Everyday | Sometimes | Never | Total n | Everyday | Sometimes | Never | Total n | |
| On way to school | 5.8% (10) | 29.8% (51) | 64.3% (110) | 171 | 2.3% (5) | 37.9% (83) | 59.8% (131) | 219 | |
| At home | 74.6% (214) | 23.0% (66)* | 2.4% (7) | 287 | 67.5% (218) | 31.6%(102)* | 0.9% (3) | 323 | .027 |
| Breakfast club | 6.7% (11) | 5.5% (9) | 87.8% (144) | 164 | 3.1% (6) | 4.1% (8) | 92.9% (182) | 196 | |
| Somewhere else | 5.1% (8) | 37.8% (59) | 57.1% (89) | 156 | 1.5% (3) | 35.9% (74) | 62.6% (129) | 206 | |

*$X^2$ =7.252; df = 2; p<0.027

### What children ate for breakfast

| | Intervention schools | | | | Control schools | | | | P |
|---|---|---|---|---|---|---|---|---|---|
| | Everyday | Sometimes | Never | Total n | Everyday | Sometimes | Never | Total n | |
| Breakfast cereal | 30.3% (84) | 63.9% (177) | 5.8% (16) | 277 | 31.9% (97) | 59.5% (181) | 8.6% (26) | 304 | |
| Toast | 13.6% (36) | 78.9% (209) | 7.5% (20) | 265 | 13.9% (41) | 75.6% (223) | 10.5% (31) | 295 | |
| Chocolate | 13.8% (33) | 38.3% (92) | 47.9% (115) | 240 | 10.0% (26) | 36.3% (94) | 53.7% (139) | 259 | |
| Fruit | 23.9% (59) | 53.4% (132) | 22.7% (56) | 247 | 20.1% (54) | 55.0% (148) | 24.9% (67) | 269 | |
| Yoghurt | 9.3% (22) | 46.2%(109)* | 44.5% (105) | 236 | 9.7% (25) | 35.1% (91)* | 55.2% (143) | 259 | .037 |
| Crisps | 12.7% (30) | 36.0% (85) | 51.3% (121) | 236 | 7.3% (19) | 36.3% (95) | 56.5% (148) | 262 | |
| Bacon | 3.8% (9) | 54.4% (130) | 41.8% (100) | 239 | 4.5% (12) | 50.7% (136) | 44.8% (120) | 268 | |
| Egg | 3.3% (8) | 57.3% (138) | 39.4% (95) | 241 | 4.2% (11) | 47.5% (125) | 48.3% (127) | 263 | |
| Cake | 2.6% (6) | 36.7%(84)** | 60.7% (139) | 229 | 1.2% (3) | 27.5%(71)** | 71.3% (184) | 258 | .036 |

Yoghurt *$X^2$ =6.580; df = 2; p<0.037 Cake **$X^2$ =6.656; df = 2; p<0.036

**What children drank at breakfast**

| | Intervention schools | | | | Control schools | | | | P |
|---|---|---|---|---|---|---|---|---|---|
| | Everyday | Sometimes | Never | Total n | Everyday | Sometimes | Never | Total n | |
| Milk | 24.4% (60) | 48.4% (119) | 27.2% (67) | 246 | 26.4% (72) | 40.7% (111) | 33.0% (90) | 273 | |
| Fizzy drink | 13.6% (32) | 36.9% (87) | 49.6% (117) | 236 | 10.3% (27) | 38.9% (102) | 50.8% (133) | 262 | |
| Fruit juice | 36.7% (91) | 47.6% (118) | 15.7% (39) | 248 | 31.9% (89) | 48.4% (135) | 19.7% (55) | 279 | |

**Proportion of children who ate a packed lunch or school meal**

| | Intervention schools | | | | Control schools | | | | P |
|---|---|---|---|---|---|---|---|---|---|
| | Packed lunch | School meal | Home | Total n | Packed lunch | School meal | Home | Total n | |
| Reported option | 67.3% (202) | 32.7% (98) | 0% (0) | 300 | 56.7% (190) | 43.0% (144) | 0.3% (1) | 335 | .017 |

*$X^2$ =8.207; df = 2; p<0.017

**Contents of packed lunch**

| | Intervention schools | | | | Control schools | | | | P |
|---|---|---|---|---|---|---|---|---|---|
| | Everyday | Sometimes | Never | Total n | Everyday | Sometimes | Never | Total n | |
| Sandwich | 78.3% (155) | 17.2% (34) | 4.5% (9) | 198 | 79.3% (149) | 17.0% (32) | 3.7% (7) | 188 | |
| Crisps | 61.9% (120) | 34.0% (66) | 4.1% (8) | 194 | 68.3% (129) | 26.5% (50) | 5.3% (10) | 189 | |
| Biscuit | 30.1% (53) | 45.5% (80) | 24.4% (43) | 176 | 25.8% (46) | 50.0% (89) | 24.2% (43) | 178 | |
| Yoghurt | 26.2% (45)* | 41.9% (72) | 32.0% (55) | 172 | 36.5% (65)* | 42.1% (75) | 21.3% (38) | 178 | .035 |
| Fruit | 34.9% (60) | 39.0% (67) | 26.2% (45) | 172 | 43.6% (79) | 35.4% (64) | 21.0% (38) | 181 | |
| Cheese | 12.7% (20) | 41.1% (65) | 46.2% (73) | 158 | 17.2% (29) | 32.0% (54) | 50.9% (86) | 169 | |
| Sausage roll | 8.8% (14) | 50.3% (80) | 40.9% (65) | 159 | 7.8% (13) | 41.9% (70) | 50.3% (84) | 167 | |
| Jelly | 5.3% (8) | 15.8% (24) | 78.9% (120) | 152 | 3.0% (5) | 25.0% (41) | 72.0% (118) | 164 | |
| Salad | 9.9% (15) | 26.3% (40) | 63.8% (97) | 152 | 5.5% (9) | 28.7% (47) | 65.9% (108) | 164 | |
| Crackers | 5.2% (8) | 40.9% (63) | 53.9% (83) | 154 | 4.9% (8) | 30.9% (50) | 64.2% (104) | 162 | |
| Something else | 44.9% (70) | 39.1% (61) | 16.0%(25)** | 156 | 33.3% (51) | 34.6% (53) | 32.0%(49)** | 153 | .004 |

Yoghurt *$X^2$ =6.704; df = 2; p<0.035 Something else **$X^2$ =11.301; df = 2; p<0.004

**School meal choices**

| | Intervention schools | | | | Control schools | | | | P |
|---|---|---|---|---|---|---|---|---|---|
| | Everyday | Sometimes | Never | Total n | Everyday | Sometimes | Never | Total n | |
| Main course | 40.5% (34) | 36.9% (31) | 22.6% (19) | 84 | 53.1% (68) | 32.8% (42) | 14.1% (18) | 128 | |
| Bread | 22.7% (20) | 53.4% (47) | 23.9% (21) | 88 | 32.1% (42) | 53.4% (70) | 14.5% (19) | 131 | |
| Potato | 9.7% (9) | 78.5% (73) | 11.8% (11) | 93 | 11.9% (15) | 69.0% (87) | 19.0% (24) | 126 | |
| Rice | 8.8% (8) | 46.2% (42) | 45.1% (41) | 91 | 6.5% (8) | 50.8% (63) | 42.7% (53) | 124 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Pasta | 17.6% (16) | 53.8% (49) | 28.6% (26) | 91 | 11.9% (15) | 66.7% (84) | 21.4% (27) | 126 | |
| Salad | 26.1% (23) | 36.4% (32) | 37.5% (33) | 88 | 26.6% (33) | 41.1% (51) | 32.2% (40) | 124 | |
| Vegetables | 26.4% (23) | 39.1% (34) | 34.5% (30) | 87 | 24.6% (31) | 46.8% (59) | 28.6% (36) | 126 | |
| Fruit | 23.6% (21) | 56.2% (50) | 20.2% (18) | 89 | 19.0% (24) | 61.9% (78) | 19.0% (24) | 126 | |
| Pudding | 60.4% (55) | 25.3% (23) | 14.3% (13) | 91 | 56.3% (76) | 35.6% (48) | 8.1% (11) | 135 | |

**Proportion of children who ate evening meal**

| | Intervention schools | | | | Control schools | | | | P |
|---|---|---|---|---|---|---|---|---|---|
| | Yes | No | Sometimes | Total n | Yes | No | Sometimes | Total n | |
| Eat evening meal | 90.3% (269) | 2.7% (8) | 7.0% (21) | 298 | 85.3% (278) | 4.6% (15) | 10.1% (33) | 326 | |

**What children ate for their evening meal**

| | Intervention schools | | | | Control schools | | | | P |
|---|---|---|---|---|---|---|---|---|---|
| | Everyday | Sometimes | Never | Total n | Everyday | Sometimes | Never | Total n | |
| Pies | 1.9% (5) | 71.3% (189) | 26.8% (71)* | 265 | 3.3% (10) | 60.6% (183) | 36.1%(109)* | 302 | .025 |
| Burgers | 3.5% (10) | 85.5% (242) | 11.0% (31) | 283 | 5.8% (18) | 81.2% (251) | 12.9% (40) | 309 | |
| Pizza | 4.9% (14) | 86.0% (245) | 9.1% (26) | 285 | 8.0% (25) | 79.4% (247) | 12.5% (39) | 311 | |
| Fried chicken | 7.5% (21) | 73.5% (205) | 19.0% (53) | 279 | 7.8% (24) | 68.6% (210) | 23.5% (72) | 306 | |
| Curry | 4.1% (11) | 55.9% (151) | 40.0% (108) | 270 | 4.2% (13) | 60.5% (187) | 35.3% (109) | 309 | |
| Sausage | 5.4% (15) | 79.1% (220) | 15.5% (43) | 278 | 5.3% (16) | 77.0% (234) | 17.8% (54) | 304 | |
| Chinese | 6.2% (17) | 68.1% (186) | 25.6% (70) | 273 | 4.6% (14) | 68.3% (209) | 27.1% (83) | 306 | |
| Chips | 15.7% (44) | 78.6% (220) | 5.7% (16) | 280 | 18.2% (57) | 75.2% (236) | 6.7% (21) | 314 | |
| Potato | 5.6%(15)** | 73.4% (196) | 21.0% (56) | 267 | 12.1%(37)** | 68.0% (208) | 19.9% (61) | 306 | .027 |
| Bread | 18.1% (48) | 59.6% (158) | 22.3% (59) | 265 | 17.9% (53) | 54.7% (162) | 27.4% (81) | 296 | |
| Chapatti | 5.5%(14)*** | 29.4% (75) | 65.1% (166) | 255 | 0.3%(1)*** | 30.0% (86) | 69.7% (200) | 287 | .001 |
| Rice | 12.1% (33) | 66.3% (181) | 21.6% (59) | 273 | 9.4% (28) | 64.2% (192) | 26.4% (79) | 299 | |
| Pasta | 9.3% (25) | 70.5% (189) | 20.1% (54) | 268 | 9.0% (27) | 72.1% (217) | 18.9% (57) | 301 | |
| Vegetables | 24.5% (68) | 56.1% (156) | 19.4% (54) | 278 | 25.3% (78) | 57.1% (176) | 17.5% (54) | 308 | |
| Fruit | 21.7% (58) | 39.3% (105) | 39.0% (104) | 267 | 17.6% (52) | 43.9% (130) | 38.5% (114) | 296 | |

Pies *$X^2$ =7.403; df = 2; p<0.025 Potato ** $X^2$ =7.257; df = 2; p<0.027 Chapatti ***$X^2$ =13.334; df = 2; p<0.001

**Who chooses what is eaten at mealtimes**

| | Intervention schools | | | Control schools | | | P |
|---|---|---|---|---|---|---|---|
| | Breakfast | Packed lunch | Evening meal | Breakfast | Packed lunch | Evening meal | |
| Child | 66.9% (186) | 42.0% (79) | 18.0% (52) | 65.6% (202) | 38.2% (71) | 23.9% (75) | .001 Br |
| Parent | 27.3% (76) | 50.5% (95) | 68.5% (198) | 17.2% (53) | 47.3% (88) | 58.0% (182) | |
| Child and parent | 4.3% (12)* | 5.3% (10) | 10.4% (30) | 14.9% (46)* | 11.8% (22) | 13.0% (41) | |
| Other | 1.4% (4) | 2.1% (4) | 3.1% (9) | 2.3% (7) | 2.1% (4) | 5.1% (16) | |
| Total number | 278 | 188 | 289 | 308 | 185 | 314 | |

*$X^2$ =; df = 2; p<0.001

**Proportion of children that ate snacks between meals**

| | Intervention schools | | | | Control schools | | | | P |
|---|---|---|---|---|---|---|---|---|---|
| | Yes | No | Sometimes | Total n | Yes | No | Sometimes | Total n | |
| Mid-morning | 29.4% (87) | 30.7% (91) | 39.9% (118) | 296 | 28.5% (93) | 25.2% (82) | 46.3% (151) | 326 | |
| Mid-afternoon | 66.2% (198) | 5.7% (17) | 28.1% (84) | 299 | 57.4% (191) | 6.0% (20) | 36.6% (122) | 333 | |
| Bedtime | 50.9% (147) | 10.0% (29) | 39.1% (113) | 289 | 44.3% (144) | 11.4% (37) | 44.3% (144) | 325 | |

**What children consume mid-morning**

| | Intervention schools | | | | Control schools | | | | P |
|---|---|---|---|---|---|---|---|---|---|
| | Everyday | Sometimes | Never | Total n | Everyday | Sometimes | Never | Total n | |
| Milk | 31.0% (76) | 38.0% (93)* | 31.0% (76) | 245 | 32.1% (80) | 26.5% (66)* | 41.4% (103) | 249 | .013 |
| Water | 49.8% (118) | 38.0% (90) | 12.2% (29) | 237 | 40.6% (103) | 40.9% (104) | 18.5% (47) | 254 | |
| Fruit juice | 27.2% (61) | 29.0% (65) | 43.8% (98) | 224 | 20.7% (46) | 32.0% (71) | 47.3% (105) | 222 | |
| Chocolate | 14.8% (34) | 32.6% (75) | 52.6% (121) | 230 | 10.7% (23) | 37.7% (81) | 51.6% (111) | 215 | |
| Sweets | 11.3% (25) | 31.5% (70) | 57.2% (127) | 222 | 10.0% (22) | 33.9% (75) | 56.1% (124) | 221 | |
| Fruit | 34.2% (80) | 47.4% (111) | 18.4% (43)* | 234 | 25.3% (58) | 43.2% (99) | 31.4% (72)* | 229 | .003 |
| Crisps | 17.3% (39) | 35.0% (79) | 47.8%(108)** | 226 | 24.3% (55) | 49.1% (111) | 26.5%(60)** | 226 | .001 |
| Cake | 7.9% (17) | 31.6% (68) | 60.5% (130) | 215 | 4.6% (10) | 28.2% (61) | 67.1% (145) | 216 | |
| Yoghurt | 12.0% (26) | 27.6%(60)*** | 60.4% (131) | 217 | 11.7% (25) | 17.8%(38)*** | 70.6% (151) | 214 | .042 |
| Raisins | 6.8% (15) | 23.3% (51) | 69.9% (153) | 219 | 6.0% (13) | 18.1% (39) | 75.8% (163) | 215 | |
| Something else | 16.7% (32) | 31.3% (60) | 52.1% (100) | 192 | 11.7% (24) | 32.2% (66) | 56.1% (115) | 205 | |

Milk*$X^2$ =8.728; df = 2; p<0.013

Food Fruit *$X^2$ =11.453; df = 2; p<0.003 Crisps ** $X^2$ =21.827; df = 2; p<0.001 Yoghurt ***$X^2$ =6.356; df = 2; p<0.042

**What children consume mid afternoon**

| | Intervention schools | | | | Control schools | | | | P |
|---|---|---|---|---|---|---|---|---|---|
| | Everyday | Sometimes | Never | Total n | Everyday | Sometimes | Never | Total n | |
| Chocolate | 28.4% (71)* | 54.8% (137) | 16.8% (42) | 250 | 19.7% (51)* | 64.5% (167) | 15.8% (41) | 259 | .048 |
| Sweets | 24.6% (58) | 52.5% (124) | 22.9% (54) | 236 | 20.4% (52) | 56.5% (144) | 23.1% (59) | 255 | |
| Fruit | 33.6% (81) | 46.5% (112) | 19.9% (48) | 241 | 32.0% (86) | 50.6% (136) | 17.5% (47) | 269 | |
| Crisps | 29.4% (73) | 52.8% (131) | 17.7% (44) | 248 | 30.6% (82) | 53.0% (142) | 16.4% (44) | 268 | |
| Cake | 11.5% (25) | 42.2% (92) | 46.3% (101) | 218 | 10.5% (25) | 45.4% (108) | 44.1% (105) | 238 | |
| Sandwich | 27.6% (64) | 37.5% (87) | 34.9% (81) | 232 | 25.2% (64) | 41.7% (106) | 33.1% (84) | 254 | |
| Yoghurt | 15.9% (35) | 46.4% (102) | 37.7% (83) | 220 | 16.9% (42) | 45.4% (113) | 37.8% (94) | 249 | |
| Raisins | 4.7% (10) | 18.2% (39) | 77.1% (165) | 214 | 4.6% (11) | 19.3% (46) | 76.1% (181) | 238 | |
| Something else | 28.9%(57)** | 42.6% (84) | 28.4% (56) | 197 | 18.6%(44)** | 50.8% (120) | 30.5% (72) | 236 | .038 |

Chocolate *$X^2$ =6.094; df = 2; p<0.048 Something else $X^2$ =6.567; df = 2; p<0.038

**What children consume at bedtime**

| | Intervention schools | | | | Control schools | | | | P |
|---|---|---|---|---|---|---|---|---|---|
| | Everyday | Sometimes | Never | Total n | Everyday | Sometimes | Never | Total n | |
| Chocolate | 16.5% (38) | 57.8% (133) | 25.7% (59) | 230 | 13.5% (33) | 53.3% (130) | 33.2% (81) | 244 | |
| Sweets | 11.6% (26) | 50.7% (114) | 37.8% (85) | 225 | 11.8% (29) | 49.8% (122) | 38.4% (94) | 245 | |
| Fruit | 25.7% (61) | 54.0% (128) | 20.3% (48) | 237 | 25.3% (66) | 55.6% (145) | 19.2% (50) | 261 | |
| Crisps | 17.0% (40) | 51.1% (120) | 31.9% (75) | 235 | 16.7% (40) | 50.2% (120) | 33.1% (79) | 239 | |
| Cake | 9.4% (21) | 54.5% (122) | 36.2% (81) | 224 | 9.3% (22) | 47.5% (112) | 43.2% (102) | 236 | |
| Sandwich | 16.4% (36) | 40.2% (88) | 43.4% (95) | 219 | 14.2% (34) | 42.5% (102) | 43.3% (104) | 240 | |
| Milky drink | 29.3% (70) | 42.7% (102) | 28.0% (67) | 239 | 25.4% (64) | 47.2% (119) | 27.4% (69) | 252 | |
| Raisins | 2.8% (6) | 16.6% (35) | 80.6% (170) | 211 | 4.8% (11) | 13.7% (31) | 81.5% (185) | 227 | |
| Something else | 21.7% (48) | 55.7% (123) | 22.6% (50) | 221 | 18.2% (42) | 48.1% (111) | 33.8% (78) | 231 | .031 |

**What children drink**

| | Intervention schools | | | Control schools | | | P |
|---|---|---|---|---|---|---|---|
| | Yes | No | Total n | Yes | No | Total n | |
| Fizzy drinks | 41.4% (126) | 58.6% (178) | 304 | 38.2% (128) | 61.8% (207) | 335 | |
| Milk | 30.6% (93) | 69.4% (211) | 304 | 34.6% (116) | 65.4% (219) | 335 | |
| Water | 56.6% (172) | 43.4% (132) | 304 | 52.7% (176) | 47.3% (158) | 334 | |
| Squash | 40.8% (124) | 59.2% (180) | 304 | 38.2% (128) | 61.8% (207) | 335 | |
| Fruit juice | 47.4% (144) | 52.6% (160) | 304 | 45.5% (152) | 54.5% (182) | 334 | |
| Tea/coffee | 26.0% (79) | 74.0% (225) | 304 | 29.9% (100) | 70.1% (235) | 335 | |

**How often children eat fruit**

| | Everyday | Most days | Some days | Hardly ever | Never | Total n | |
|---|---|---|---|---|---|---|---|
| Intervention schools | 34.0% (103) | 30.7% (93) | 25.4% (77) | 6.9% (21) | 3.0% (9) | 303 | |
| Control schools | 35.0% (117) | 30.5% (102) | 24.0% (80) | 8.4%% (28) | 2.1% (7) | 334 | |

## Activity patterns

**Method of travel to school**

| | Walking* | By car^ | By bus | Cycling | Other | Total n | |
|---|---|---|---|---|---|---|---|
| Intervention schools | 64.8% (197) | 46.1% (140) | 7.6% (23) | 3.0% (9) | 0.7% (2) | 371 | *.024 |
| Control schools | 73.1% (244) | 37.7% (126) | 5.7% (19) | 1.5% (5) | 0.9% (3) | 397 | ^.033 |

**Method of travel from school**

| | Walking | By car | By bus | Cycling | Other | Total n | |
|---|---|---|---|---|---|---|---|
| Intervention schools | 71.6% (217) | 39.9% (121) | 7.6% (23) | 3.6% (11) | 0.7% (2) | 374 | |
| Control schools | 75.1% (251) | 34.4% (115) | 6.6% (22) | 1.8% (6) | 1.8% (6) | 400 | |

**Participation in playtime activities**

| | Sit down | Stand | Walk | Run around | Other * | Total n | |
|---|---|---|---|---|---|---|---|
| Intervention schools | 8.1% (24) | 4.4% (13) | 17.5% (52) | 80.1% (238) | 15.5% (46) | 373 | *.029 |
| Control schools | 10.3% (34) | 5.4% (18) | 21.8% (72) | 75.2% (249) | 22.4% (74) | 447 | |

**Enjoy PE lessons**

| | Intervention schools | | | | Control schools | | | | P |
|---|---|---|---|---|---|---|---|---|---|
| | Yes | No | Depends | Total n | Yes | No | Depends | Total n | |
| Enjoy lessons | 61.1% (184) | 4.3% (13) | 34.6% (104) | 301 | 64.7% (212) | 2.7% (9) | 32.6% (107) | 328 | |

**PE participation**

| | Gym | Netball | Football | Rounders | Cricket | Rugby * | Swim^ | Basketball | None | Other | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Intervention schools | 29.3%(88) | 27.7%(83) | 63.7%(191) | 38.3%(115) | 27.0%(81) | 23.0%(69) | 60.0%(180) | 26.0%(78) | 4.7%(14) | 35.0%(105) | *.040 |
| Control schools | 24.9%(83) | 23.4%(78) | 65.8%(219) | 41.1%(137) | 22.8%(76) | 16.5%(55) | 69.8%(233) | 22.2%(74) | 2.7%(9) | 35.1%(117) | ^.010 |

**Frequency of Television viewing**

| | Every day | Most days | Some days | Never | Total n | P |
|---|---|---|---|---|---|---|
| Intervention schools | 49.7% (150) | 24.2% (73) | 24.8% (75) | 1.3% (4) | 302 | |
| Control schools | 42.2% (140) | 28.8% (95) | 27.3% (90) | 1.5% (5) | 330 | |

**Frequency of playing computer games**

| | Every day | Most days | Some days | Never | Total n | P |
|---|---|---|---|---|---|---|
| Intervention schools | 21.3% (64) | 28.2% (85) | 38.2% (115) | 12.3% (37) | 301 | |
| Control schools | 21.8% (72) | 24.5% (81) | 41.5% (137) | 12.1% (40) | 330 | |

**Body dissatisfaction scores of children**

| Score | -6 | -5 | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | Total n |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Boys | | | | 0.3%(1) | 0.9%(3) | 11.3%(37) | 57.2%(187) | 19.0%(62) | 9.2%(30) | 1.5%(5) | 0.6%(2) | | 327 |
| Girls | 0.3%(1) | | 0.3%(1) | | 0.7%(2) | 8.3%(25) | 47.0%(142) | 29.8%(90) | 8.3%(25) | 3.0%(9) | 1.3%(4) | 1.0%(3) | 302 |

**Psychological well being**

| | Intervention schools | | | | Control schools | | | | P |
|---|---|---|---|---|---|---|---|---|---|
| | Worries me a lot | Worries me a little | Hardly ever worries me | Total n | Worries me a lot | Worries me a little | Hardly ever worries me | Total n | |
| Making fun of me | 14.1% (42) | 30.6% (91) | 55.3% (164) | 297 | 14.7% (48) | 30.4% (99) | 54.9% (179) | 326 | |
| Called names | 15.3% (45) | 33.6% (99) | 51.1% (151) | 295 | 15.0% (49) | 33.3% (109) | 51.7% (169) | 327 | |

| | Boys | | | | Girls | | | | P |
|---|---|---|---|---|---|---|---|---|---|
| | Worries me a lot | Worries me a little | Hardly ever worries me | Total n | Worries me a lot | Worries me a little | Hardly ever worries me | Total n | |
| Making fun of me | 10.6% (34) | 27.2% (87) | 62.2% (199) | 320 | 18.2% (55) | 34.1% (103) | 47.7% (144) | 302 | .001 |
| Called names | 11.2% (45) | 31.9% (102) | 56.9% (182) | 320 | 19.3% (58) | 34.7% (104) | 46.0% (138) | 300 | .005 |

**How you feel about yourself**

| | Very unhappy | Unhappy | OK | Happy | Very happy | Total n | |
|---|---|---|---|---|---|---|---|
| Intervention schools | 3.3% (10) | 2.3% (7) | 16.4% (49) | 28.1% (84) | 49.9% (149) | 299 | |
| Control schools | 4.2% (14) | 4.5% (15) | 17.1% (57) | 22.2% (74) | 52.0% (173) | 333 | |

| | Very unhappy | Unhappy | OK | Happy | Very happy | Total n | |
|---|---|---|---|---|---|---|---|
| Boys | 1.5% (5) | 2.8% (9) | 18.0% (59) | 21.2% (69) | 56.5% (185) | 327 | .001 |
| Girls | 6.2% (19) | 4.3% (13) | 15.5% (47) | 29.3% (89) | 44.7% (136) | 304 | |

| | Very unhappy/unhappy | OK | Happy/very happy | Total n | P |
|---|---|---|---|---|---|
| Thin/healthy | 4.2% (15) | 13.6% (48) | 82.2% (290) | 353 | .001 |
| Overweight/obese | 14.2% (25) | 21.6% (38) | 64.2% (113) | 176 | |

# APPENDIX 4

# **Be Healthy** EDUCATION PACK

Be healthy

**Be**xley, **h**ealthy **e**ating, **a**ctive **l**ifestyle by **t**eaching **h**ealth for **y**oungsters

The Be healthy project has been designed to promote healthy lifestyles for schoolchildren in Bexley.

The Be healthy project has been based on data collected from schoolchildren in the borough and encourages a healthy lifestyle for children by giving pupils consistent messages about health throughout the whole school, lessons, playtimes and school meals.

This folder has been adapted from the British Dietetic Association Eat 2b Fit a teaching resource for primary schools for the needs of Bexley children. It consists of teaching notes, ideas for classroom activities and the resources needed for six sessions on healthy eating - two activities to be discussed each half term.

- Session 1 – The balance of Good Health
- Session 2 – Fruit and Vegetables
- Session 3 – Breakfast
- Session 4 – Snacks
- Session 5 – Lunchboxes
- Session 6 – Food and Activity

The physical activity theme is incorporated into existing physical education lessons, one lesson each half term.

**SESSION 1**

# The Balance of Good Health

## Preparation for lesson

### Food diary

Ask the children to fill in the food diary (activity sheet 4) with their intake for the previous day and bring to the lesson.

### Resources needed for the extra activities

Provide or ask the children to bring in:

- Empty packets of food from home to sort into food groups during the lesson
- Food pictures
- Examples of food advertised in magazines

**SESSION 1**

# The Balance of Good Health

Sorting foods and allocating them to their food groups, whether on the basis of types of food, their functions, or the nutrients they contain, is included in all three units. This activity is suitable for all units (2A, 3A, 5A), with extension activities for older and more able children.

## AIM

To help children learn how to group foods within the Balance of Good Health, and to know that selecting foods in the right proportions will ensure a healthy balanced diet.

**MAIN ACTIVITY**

**Ask children to fill in a food diary – either written or drawn** (activity sheet 4) **– and then transfer the foods to a blank Balance of Good Health plate** (Activity sheet 2). **Now compare foods recorded in the Diary with those illustrated in the Balance of Good Health diagram** (Activity sheet 1)

**DISCUSSION POINTS**

- What foods should you eat more of or less of to make a balanced diet?
- What makes up a balanced meal? Important: children often appear to have a very good grasp of how to sort the food but fail to choose from all groups when asked to draw or select a meal.
- Which foods appear most in advertisements or our list of favourites? With older children this could be extended to discuss the power of advertising or peer pressure.

**EXTRA ACTIVITIES**

- Sort into Balance of Good Health groups:
  - -clip art images of food
  - -favourite foods
  - -empty packets brought in from home (could be sorted into coloured hoops to represent the colours of the groups)
  - -foods advertised in magazines or on television

**EXTRA RESOURCES**

- Empty food containers, food pictures and clip art of food
- Eat 2b Fit poster and postcards
- Eat 2b Fit factsheet 5

Activity idea based on the British Dietetic Association Eat 2b Fit a teaching resource for primary schools for the Be healthy programme.

**SESSION 1**

# CHECKLIST

Please rate the activities and resources and tick the activities you used with the class.

| | Activity used in classs | poor | good | excellent | comments |
|---|---|---|---|---|---|
| Overall lesson content | | | | | |
| **activities** | | | | | |
| Food diary | | | | | |
| Balance of good health plate and diagram | | | | | |
| Sort into balance of good health groups | | | | | |
| **resources** | | | | | |
| Eat 2b Fit poster and cards | | | | | |
| Eat 2b Fit factsheets | | | | | |
| | | | | | |

Would you use this session again yes / no

Did the children enjoy the session yes / no

How long did the session last? _____

Number of children in class _____ Year 5 / Year 6

Have the children covered this topic in any other lessons?

Any additional comments.

# Food Diary

Day_____

**Enter everything you eat and drink**

| TIME | FOOD | AMOUNT | DRINK |
|---|---|---|---|
| EARLY MORNING | | | |
| BREAKFAST | | | |
| DURING MORNING | | | |
| MIDDAY | | | |
| DURING AFTERNOON | | | |
| EVENING MEAL | | | |
| DURING EVENING AND BEFORE BED | | | |
| EXTRAS DURING NIGHT | | | |

ACTIVITY SHEE




drink

bread, cereals and potatoes

milk and dairy foods

fatty and sugary foods

meat, fish and alternatives

fruits and vegetables

# Eat 2b Fit


Watch your snacks closely — choose them wisely.

IT'S IMPORTANT that you give your body all the goodness it needs to work properly, to help you grow well, and to be a healthy weight.

**Make sure you eat** from the **FIVE** different food groups:

- **Fruit and vegetables**
- **Bread, other cereals and potatoes**
- **Milk and dairy products**
- **Meat, fish and alternatives**
- **Foods containing fat and foods containing sugar**

But **HOW MUCH** of each of these food groups should you eat?

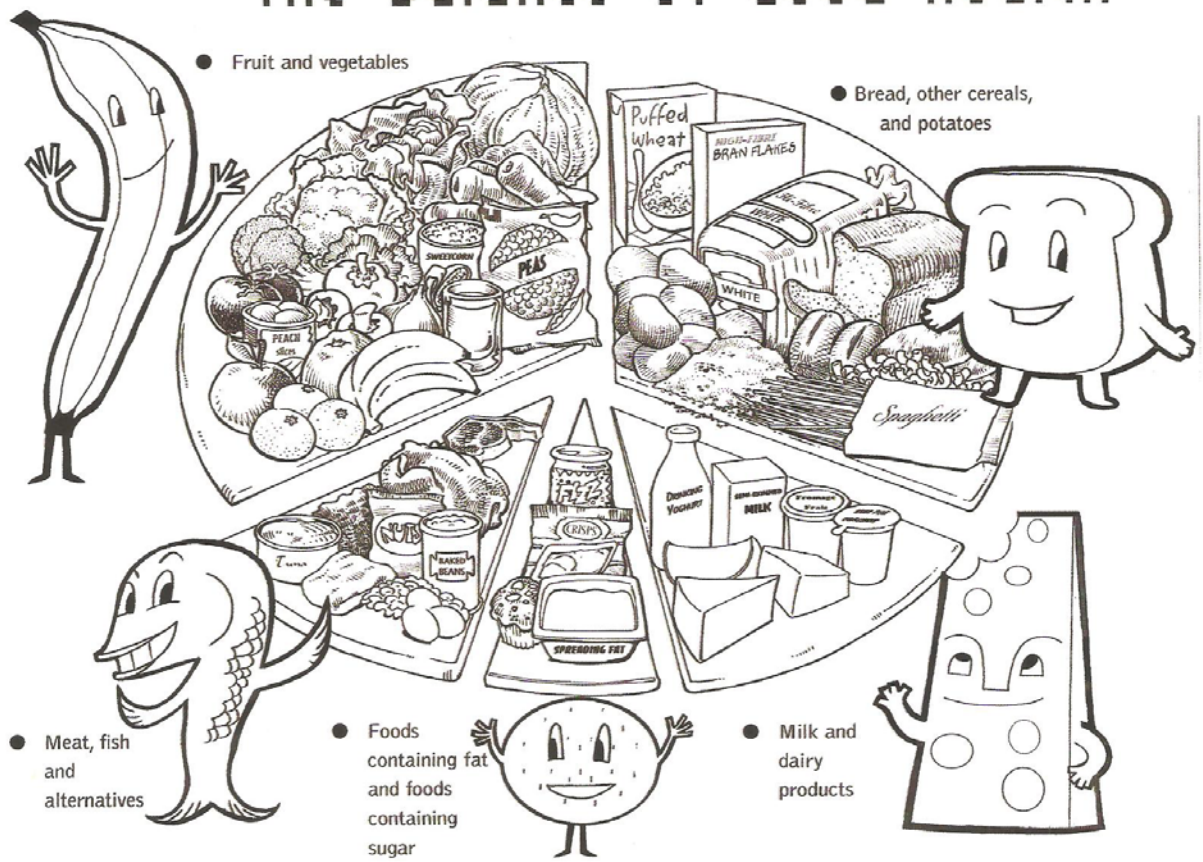
Look at the plate model below. This is known as the **BALANCE OF GOOD HEALTH**.

Do you eat food from **EACH FOOD GROUP**?

Eat **MORE** from the **BIGGER** sections, and **LESS** from the **SMALLER** sections.

FACTSHEET 5

## The Balance of Good Health




*Remember - breakfast is a great way to start the day!*

**SESSION 2**

# Fruit and Vegetables

## Preparation for lesson

## Resources needed for extra activities

- Fruit or vegetable for guess how many competition
- A to Z fruit and vegetables chart for classroom activity during the week

SESSION 2

# Fruit and Vegetables

It is important to highlight the message about eating five servings a day to protect against infection and disease.

**AIM**

To remind the children that a healthy diet includes at least 5 servings of fruit and vegetables a day in order (among other things) to ensure there are sufficient protective vitamins, including vitamins C, A and folate in the diet. To examine how it might be possible to encourage themselves and others to eat more of these foods.

**MAIN ACTIVITY**

**Ask children how many servings of fruit and vegetables they have in an average day. Can they think of ways people could be encouraged to eat more? The empty hand** (activity sheet 8) **could be used to draw a days portions. The children should draw and write each fruit or vegetable they ate the previous day onto the hand and add up the total. The class could display their combined results in a table or graph.**

**DISCUSSION POINTS**

- Although fruits are pleasant to eat, children tend to eat sweets, biscuits and crisps for puddings and snacks. Why? Could this be because fruit is not readily available, is not advertised so does not have street cred, or is it too perishable to be convenient? The children could consider ways in which these could be overcome so people's habits could change.

**EXTRA ACTIVITIES**

- Ask groups of children to write an advertisement for some form of fruit or vegetable, maybe with a catch phrase or using a popular tune.
- Have a competition to guess how many e.g. grapes in a bunch, pips in a grapefruit.
- As a classroom activity fill in the A to Z fruit and vegetable chart with different fruit and vegetables that begin with each letter of the alphabet.

**EXTRA RESOURCES**

- A to Z fruit and vegetable chart
- Fruit and vegetable poster

Activity idea based on the British Dietetic Association Eat 2b Fit a teaching resource for primary schools for the Be healthy programme.

**SESSION 2**

# CHECKLIST

Please rate the activities and resources and tick the activities you used with the class.

| | Activity used with the classs | poor | good | excellent | comments |
|---|---|---|---|---|---|
| Overall lesson content | | | | | |
| **activities** | | | | | |
| Empty hand sheet | | | | | |
| Write an advertisement for a fruit or vegetable | | | | | |
| Fruit competition | | | | | |
| A to Z fruit and vegetable chart | | | | | |
| **resources** | | | | | |
| A to Z chart | | | | | |
| Fruit and vegetable poster | | | | | |
| Give me 5 snapper | | | | | |

Would you use this session again yes / no

Did the children enjoy the session yes / no

How long did the session last? _____

Number of children in class _____ Year 5 / Year 6

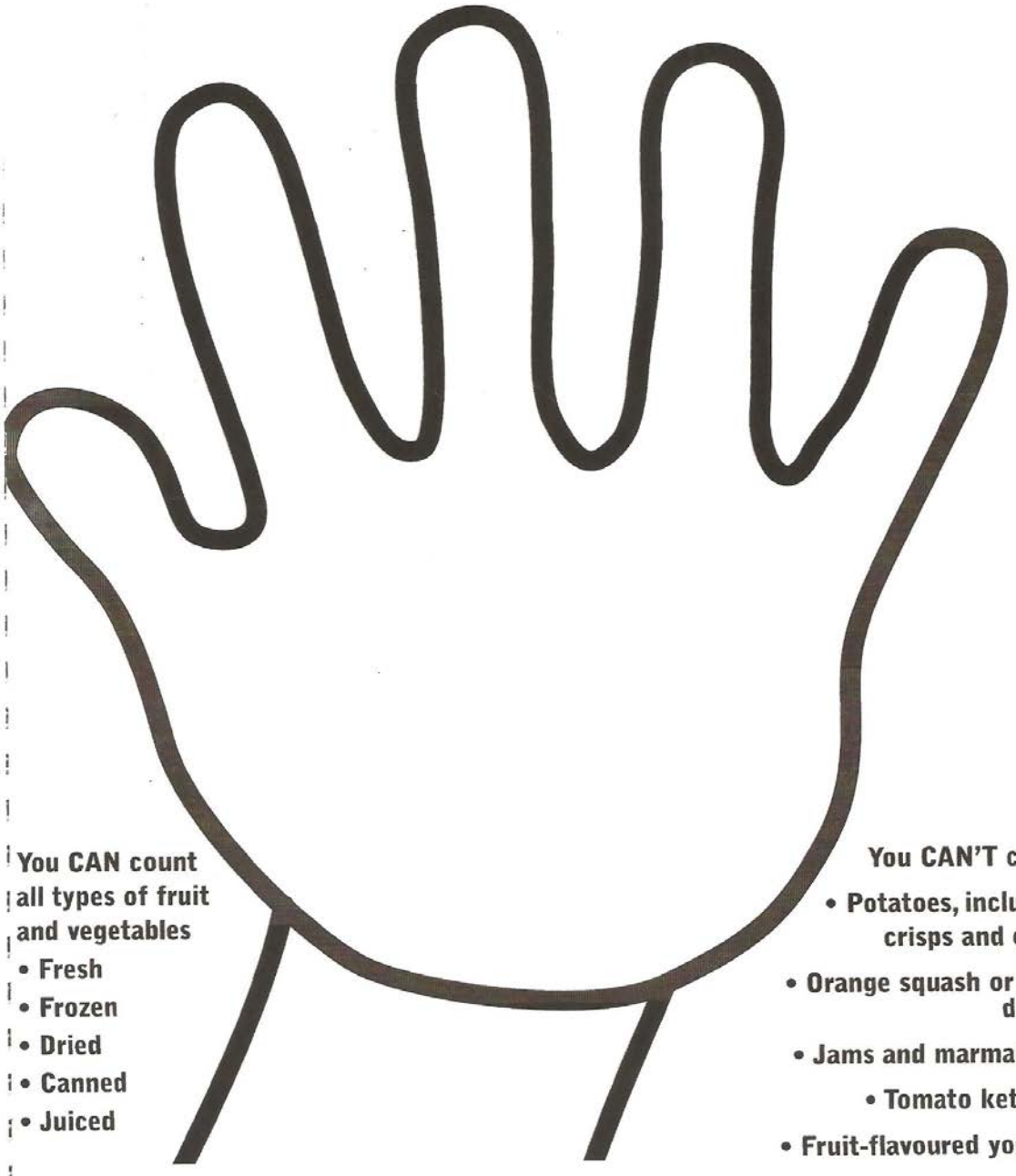
Have the children covered this topic in any other lessons?

Any additional comments

ACTIVITY SHEET

# Give me 5 Hand


How many portions of fruit and vegetables have I had?



**You CAN count all types of fruit and vegetables**

- Fresh
- Frozen
- Dried
- Canned
- Juiced

**You CAN'T count**

- Potatoes, including crisps and chips
- Orange squash or fruit drinks
- Jams and marmalades
- Tomato ketchup
- Fruit-flavoured yogurts

SESSION 3

# Breakfast

This lesson focuses on the role of breakfast in a healthy diet.

## AIM

To help children understand the importance of starting the day by eating a healthy breakfast.

**MAIN ACTIVITY**

**What do you eat for breakfast?**
**Ask the children what they would normally eat for breakfast. Make a list of all the different types of food eaten and find out the most popular item.**
**Working in small groups children should:**
**- Explore how these breakfasts could be improved by comparing to the balance of good health diagram.**
- **Plan a healthy breakfast**
- **To eat at home**
- **To eat when there is little time.**

**Produce a poster of the suitable breakfasts to be displayed in the classroom.**

**DISCUSSION POINTS**

- Breakfast helps top up your energy stores after a nights sleep and gives you energy for the morning activities.
- Breakfast can provide many essentials nutrients that the body needs and people who eat breakfast have more balanced diets.
- Children who eat a breakfast find it easier to concentrate and do better at school.
- Discuss reasons why children do not eat breakfast and how these can be changed.
- The importance of having a drink with breakfast.

**EXTRA ACTIVITIES**

- Use the Nutrition Mission CD-ROM to learn more about a healthy, balanced diet.

**EXTRA RESOURCES**

- What do you eat for breakfast? Factsheet.
- Balance of good health diagram.

**SESSION 3**

# CHECKLIST

Please rate the activities and resources and tick the activities you used with the class.

| | Activity used with the classs | poor | good | excellent | comments |
|---|---|---|---|---|---|
| Overall lesson content | | | | | |
| **activities** | | | | | |
| What do you eat for breakfast? | | | | | |
| Plan a healthy breakfast | | | | | |
| Produce a poster | | | | | |
| **resources** | | | | | |
| What do you eat for breakfast factsheet | | | | | |
| Balance of good health diagram | | | | | |
| Nutrition Mission CD-ROM | | | | | |

Would you use this session again yes / no

Did the children enjoy the session yes / no

How long did the session last? _____

Number of children in class _____ Year 5 / Year 6

Have the children covered this topic in any other lesson?

Any additional comments

# The Balance of Good Health

**SESSION 4**

# Snacks

## Preparation for lesson

## Main activity

Provide or ask the children to bring in:
A selection of food labels where the fat and sugar content of the food is listed - examples of foods to include are,
Small packets of dried fruits
Low fat yoghurt
Crisps
Currant bun
Chocolate bars
Popcorn
Milkshakes
Biscuits
Muesli bars
Sweets
Bread
Breakfast cereal

SESSION 4

# Snacks

This lesson focuses on foods containing high proportions of either fat or sugar, or both. Fats and sugars are often found in foods eaten as snacks. It is important to highlight the fact that eating too many of these foods at the expense of a balanced mixture of the other groups means that valuable nutrients may be missing.

## AIM

To help children identify foods containing appreciable amounts of fat and sugar.

## MAIN ACTIVITY

**Collect a selection of food labels where the fat and sugar content of the foods is listed. Put the children into small groups and pass the labels round the groups.**

**Ask:**

- **What is the food?**
- **How much energy is in 100g, and in one serving?**
- **Is it high in fat (i.e. does it contain 20g or more per serving)?**
- **Is it high in sugar (i.e. does it contain 10g or more per serving)?**
- **What else does it contain?**

**Using the food labels make a list of the foods that contain the most and least amount of fat and sugar in one serving.**

## DISCUSSION POINTS

Foods containing fat and sugar can have a place in a healthy diet providing sufficient foods have also been chosen from the other groups. You could discuss how this can be achieved using snack foods as an example.

## EXTRA ACTIVITIES

- Ask the children to make their own food label (activity sheet 10 and factsheet 7 and 8).
- Review choice of snacks and discuss foods from other groups for which foods containing fat or sugar could be exchanged.

## EXTRA RESOURCES

- Food labels
- What can a food label tell you? (factsheet 7 and 8)
- Snack attack 2 (factsheet4)

Activity idea based on the British Dietetic Association Eat 2b Fit a teaching resource for primary schools for the Be healthy programme.

## SESSION 4

# CHECKLIST

Please rate the activities and resources and tick the activities you used with the class.

| | Activity used with the classs | poor | good | excellent | comments |
|---|---|---|---|---|---|
| Overall lesson content | | | | | |
| **activities** | | | | | |
| Compare food labels - fat and sugar content | | | | | |
| Write your own food label | | | | | |
| Look at choice of snacks | | | | | |
| **resources** | | | | | |
| Food labels | | | | | |
| What can a food label tell you | | | | | |
| Snack attack 2 | | | | | |

Would you use this session again yes / no

Did the children enjoy the session yes / no

How long did the session last? _____

Number of children in class _____ Year 5 / Year 6

Have the children covered this topic in any other lesson?

Any additional comments

# Make your own food label


LOOK AT SOME FOOD LABELS.
What information is included on them about the foods you eat?

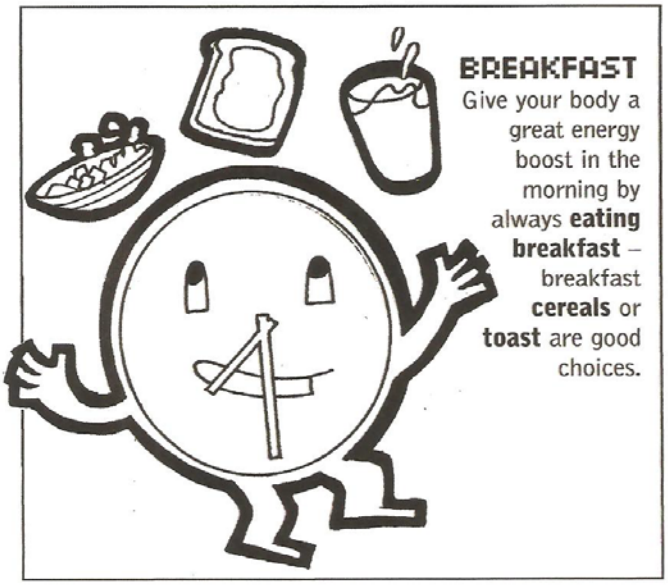
Design a packet for a food. Fill in the details you might see on the label on the packet.

**Packet**

**Label**

| **Name of food** | **Weight** |
|---|---|
| **Ingredients list** | |
| **Storage Information** | **Best by date** |
| **Made in** | |
| **Nutrition Information** | |

# Snack Attack!/2



**BREAKFAST**
Give your body a great energy boost in the morning by always **eating breakfast** – breakfast **cereals** or **toast** are good choices.

## END-OF-SCHOOL SNACKS

You've just **come home** and it's **hours** until your next meal. What can you eat? Instead of raiding the biscuit tin, try one of these tasty snacks:

- Bowl of cereal and milk
- Fruit – fresh or dried, e.g. raisins
- Sticks of raw vegetables, e.g. carrot, cucumber, cherry tomatoes
- A jacket potato
- Fruit bun or malt loaf

- Rice cakes
- Crumpet or muffin topped with mashed banana
- Low fat yogurt or fromage frais
- Slice of toast or a sandwich

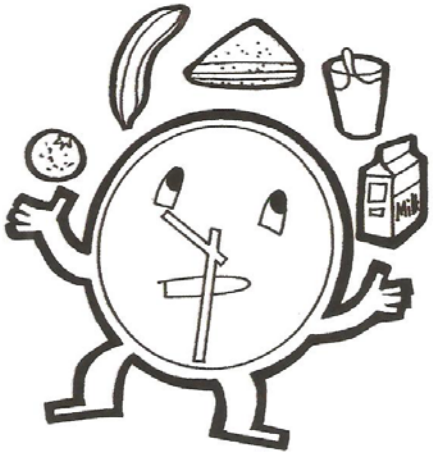
These are better than sugary foods such as sweets, which will only give you a short burst of energy and could harm your teeth.


## BREAKTIME MUNCHES

It's breaktime and you're starving. Did you have breakfast? If not, make sure you have it tomorrow – starting the day with some cereal or toast will keep away those hunger pangs at break, and may help you concentrate better in class. **Still hungry?** Try one of these:

- Fruit, e.g. banana, apple, satsuma
- Currant bun, plain scone or toast
- A sandwich or small slice of pizza
- Low fat yogurt
- Milk, milkshake or smoothie

If your school doesn't provide any of these breaktime munchies, why not mention it to your teacher or the school council? Try to set up a Healthy Tuck Shop. Perhaps your school only allows fruit or vegetables at break, so make the most of it and munch away...




FACTSHEET 4

British Dietetic Association
FOOD FIRST
FACTSHEET
4


# What Can a Food Label Tell You?


Food labels provide useful information. They can help you know more about the foods you eat and help you choose a balanced diet.

**The label must show**

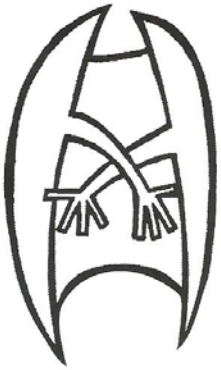
- The name of the food
- The weight of the food
- The list of ingredients
- How the food should be stored
- The date the food should be eaten by
- The name and address of the manufacturer.

**Here is a food label:**

| **BAKED BEANS IN TOMATO SAUCE** |
|---|
| **WEIGHT:** 415g |
| **BEST BEFORE:** 03-2004 |
| **ORIGIN:** Made in England |
| **Storage instructions**<br>Empty unused contents in a suitable covered container.<br>Keep refrigerated and use within 2 days. |
| **Ingredients**<br>Beans (49%), tomatoes (27%), water, sugar, glucose syrup, salt, modified cornflour, spirit vinegar, spice extracts, herb extract. |

| Nutrition information | |
|---|---|
| | **per 100g** |
| **ENERGY** | **308 k J.**<br>**73 k cal** |
| **PROTEIN** | 4.6g |
| **CARBOHYDRATE** | 13.1g |
| of which sugars | 5.0g |
| **FATS** | **0.2g** |
| of which saturates | trace |
| **FIBRE** | **3.6g** |
| **SODIUM** | **0.4g** |
| **PER SERVING 207g (half a can)** | **150 calories**<br>**0.4g fat** |

What information does it give you?
Where does the food come from?
What are the main ingredients?
How should you store it?
When do you need to eat it by?



*Some labels are very shy and like to hide all their information!*

SESSION 5

# Lunchbox

This lesson focuses on what makes a healthy lunchbox and how this can be achieved by choosing foods from the four main food groups.

**AIM**
To remind children that having a balance and variety of foods in the diet is important for health.

**MAIN ACTIVITY**

**Design a leaflet or poster promoting healthier lunchboxes for use in schools.**

**DISCUSSION POINTS**
- A lunchbox provides a valuable contribution towards a child's nutritional requirements for a day, discuss the importance of choosing foods from the four main food groups.
- Many lunchboxes do not include any fruit or vegetables; discuss why this may happen.
- Packed lunches don't have to be boring, discuss ways of adding different tastes and textures.
- No lunch is complete without a drink, keeping hydrated helps children stay alert and healthy.
- Discuss ways lunchboxes can be kept cool.

**EXTRA ACTIVITIES**
- Design a class lunchbox recipe and idea book.
- Create a display on the theme of healthy lunchboxes
- Use the Nutrition Mission CD-ROM to learn more about a healthy, balanced diet.

**EXTRA RESOURCES**
- Pack a healthy lunch factsheets 1 and 2.
- Lunchbox leaflet.

## SESSION 5

# CHECKLIST

Please rate the activities and resources and tick the activities you used with the class.

| | Activity used with the class | poor | good | excellent | comments |
|---|---|---|---|---|---|
| Overall lesson content | | | | | |
| **activities** | | | | | |
| Design a leaflet or poster on healthy lunchboxes | | | | | |
| Recipe and idea book | | | | | |
| Display on the theme of healthy lunchboxes | | | | | |
| **Resources** | | | | | |
| Pack a healthy lunch factsheets | | | | | |
| Healthy lunchbox leaflet | | | | | |
| Nutrition Mission CD-ROM | | | | | |

Would you use this session again yes / no

Did the children enjoy the session yes / no

How long did the session last? _____

Number of children in class _____ Year 5 / Year 6

Have the children covered this topic in any other lesson?

Any additional comments

British Dietetic Association
FOOD FIRST
FACTSHEET
1

# Pack a Healthy Lunch

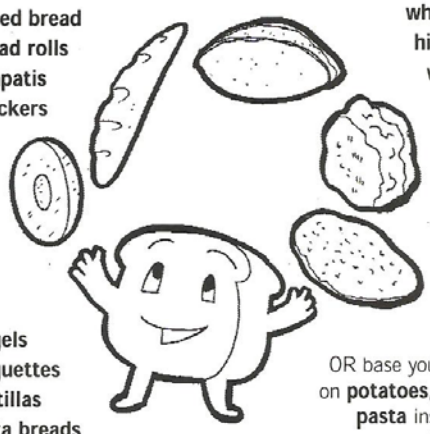

Packed lunches can be **FUN**, **HEALTHY** and **TASTY** too. **JUGGLE AROUND** with different ideas. **CHOOSE** something from each of the **FOUR MAIN FOOD GROUPS**, pop in a **DRINK** and **AWAY YOU GO**!

## STARCHY STARTERS

**Bread, cereals and potatoes** give you plenty of energy and help to fill you up. Try not to have the same sandwiches day after day – be adventurous and try something different!

**sliced bread**
**bread rolls**
**chapatis**
**crackers**

**wholemeal**
**high fibre**
**wheaten**
**granary**
**brown**
**white**
**soda**

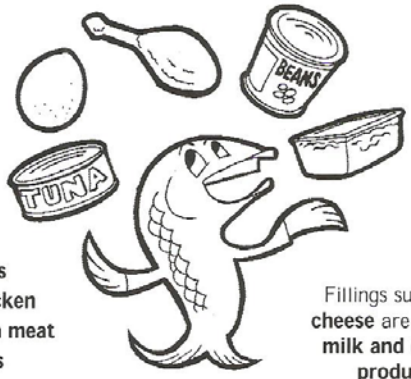


**bagels**
**baguettes**
**tortillas**
**pitta breads**
**muffins**

OR base your lunch on **potatoes**, **rice** or **pasta** instead of sandwiches! Turn over to see how.

## FABULOUS FILLINGS

**Meat, fish** and **alternatives** are a good source of protein and iron, and great in sandwiches or salads. Turn over for some suggestions – it's easy when you know how.

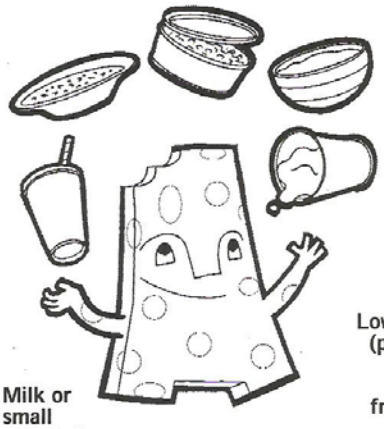



**fish**
**eggs**
**chicken**
**lean meat**
**nuts**
**beans**
**pulses**

Fillings such as **cheese** are from **milk and dairy products** – see DAIRY DELIGHTS below!

## DAIRY DELIGHTS

**Milk** and **dairy products** contain calcium, which keeps your teeth healthy and helps your bones grow strong.



**Small pot of rice pudding or custard dessert**

**Low-fat yogurt (plain or fruit flavoured) or low fat fromage frais**

**Milk or small milkshake**

## FEELING FRUITY?

Eating 5 (or more) portions of **fruit** and **vegetables** every day helps you stay fit and healthy. Put **two or more portions** in your lunchbox!


**FRESH FRUIT** – apple, grapes, banana, kiwi fruit, satsuma, pear or plums

**DRIED FRUITS** – a handful of raisins, apricots, bananas or peaches ... a small packet or box is fun

**CHOPPED RAW VEGETABLES** – carrot sticks, cherry tomatoes, mixed salad in a container

**CANNED FRUIT IN NATURAL JUICE** – pop into a small container or buy a small can with a ring pull

*VARIETY is the spice of life! Try something different TODAY!*

SESSION 6

# Food and Activity

This lesson explores the relationship between food and their role in providing the body with energy required for activity. The focus will be on starchy carbohydrate foods (bread, other cereals and potatoes).

## AIM

To help children identify starchy foods and recognise their importance in providing energy for the body.

**MAIN ACTIVITY**

**Keep a food and activity record. Divide a sheet of paper up to represent different parts of their day** (you could use a timeline format- activity sheet 9). **Write or draw all eating and physical activities**.

**Can you identify the foods from this group (bread, cereals, potatoes, rice, other grains and pasta) on the time line or chart?**

**DISCUSSION POINTS**

- Eating involves the intake of energy, and activity uses it up. Can you identify the meals/food most likely to provide the energy for each activity?
- Discuss the importance of a starch rich breakfast. Why do you think starch is important at this meal, and what do you think would make a good breakfast?
- Studying this food group is a good starting point for the study of different cultures, especially in a multiethnic class where examples of different cultural foods could be brought in and compared.

**EXTRA ACTIVITIES**

- Different cultures and geographical areas have their own traditional staple starches. Ask children to compile a list of all they know. Display pictures and show where they all come from on a map of the world.

**EXTRA RESOURCES**

- Snack attack 1 (factsheet 3)
- Move 2b Fit (factsheets 9 and 10)

Activity idea based on the British Dietetic Association Eat 2b Fit a teaching resource for primary schools for the Be healthy programme.

## SESSION 6

# CHECKLIST

Please rate the activities and resources and tick the activities you used with the class.

| | Activity used with the class | poor | Good | excellent | comments |
|---|---|---|---|---|---|
| Overall lesson content | | | | | |
| **Activities** | | | | | |
| Food and activity record | | | | | |
| List of traditional staple foods | | | | | |
| Display traditional foods on a map of the world | | | | | |
| **Resources** | | | | | |
| Snack attack 1 | | | | | |
| Move 2b fit | | | | | |
| Eat 2b fit stickers | | | | | |

Would you use this session again yes / no

Did the children enjoy the session yes / no

How long did the session last? _____

Number of children in class _____ Year 5 / Year 6

Any additional comments

# Food and Activity Timeline


MAKE A TIMELINE of one day's eating and activity. Record food eaten **above the line** and activities **below the line.**

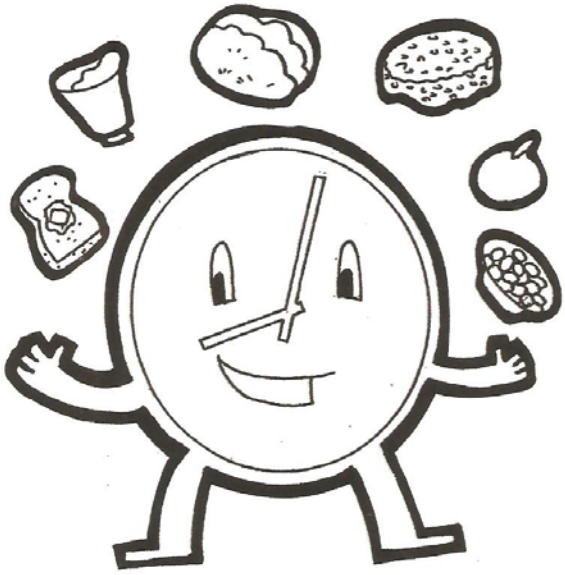
Went to bed

FOOD EATEN

ACTIVITIES

Got up

# Snack Attack!/1



It can be fun to snack, and most of us do it. And here's the GOOD NEWS – snacking can be good for you!

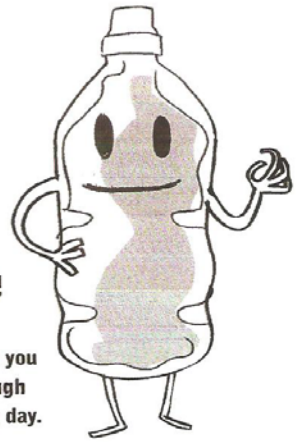
FACTSHEET 3

**Your body is just like a car**. But where cars need petrol to give them energy, you need **food**. And the best way for you to get enough energy is to **eat regular meals** with **some snacks** through the day.

Just as a car works best on one type of petrol, your body works best on certain types of foods. But if you eat a lot of foods full of fat and sugar you might not be at your best.

**So go ahead and snack THE HEALTHY WAY ...**

- **Eat regular meals** or your energy levels will fall and you could feel tired. Start the day with **breakfast**.
- Fill up on plenty of **starchy foods** such as **bread, potatoes, breakfast cereals, pasta** and **rice** – these are your body's favourite fuels.
- Make sure you eat your **5 portions of fruit and vegetables** every day.
- Eat **less fatty foods** such as chocolates, biscuits, pastry and crisps.
- Keep **sugary things** like fizzy drinks and sweets to **mealtimes**.



## BE COOL!

- **Make sure you drink enough during the day.**
- Have a **drink with each meal** and **at least once between meals. Aim for 8-10 drinks a day.**
- **Drink extra** when the weather is **hot** or if you are being more **active** or doing **sport**.
- Try to go for **water** or **milk** as lots of fizzy drinks or squashes, especially between meals, can damage your teeth. When you do have these, keep them to **mealtimes only**. Watch out for **diet drinks** too as, although they are lower in sugar, the acid in them can still **harm your teeth**.
- **Fruit juices** also contain natural sugar so keep to just **1 glass a day**.

# Move 2b Fit/2



MOST PEOPLE find it easier to do 30 minutes to an hour of physical activity each day if they carry out a few short blocks of activity during the day, such as:

- **Walk or cycle to school or work**
- **Use stairs** instead of lifts and escalators
- **Find a sport or activity** to **enjoy**
- Do a **variety** of different activities
- Join or **do things with other people,** such as friends or family

## SAFETY TIPS

When you're being active:

- Think about safety – yours and the people around you
- Wear comfortable clothing, sensible footwear, and the correct safety equipment
- Never go out alone
- Always tell an adult where you are going and when you expect to be back
- Have your bike and any other equipment checked regularly
- Remove jewellery and watches
- Make sure the area is safe, well lit, has no slippery surfaces and is free from obstacles. Stay away from busy roads.
- At **night**, wear light or reflective clothing
- Make sure you **drink plenty**, especially when it is hot.

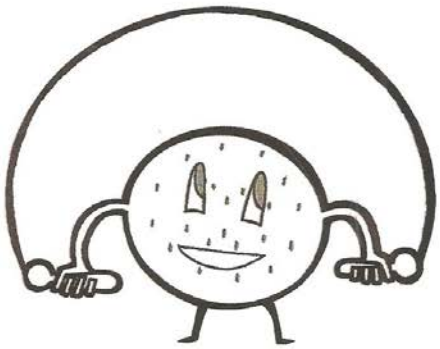
**Never** do vigorous exercise if you feel unwell, are still recovering from an illness or injury, or have just eaten a meal.

## Ways to be more active

- At breaktimes use the playground to **kick a ball, play tag** or other **running games,** or **walk** with friends.
- Try **skipping** – all you need is a rope.
- Join in **after-school clubs** and activities
- **Walk** or **cycle together** as a family at weekends
- **Dance** to your favourite music.

### Sitting for too long?

If you have been sitting, watching TV or using the computer for more than 30 minutes, get up and do something active!



### Time Out

**You can't be active all of the time. But if you snack when watch television, do your homework or use a computer, don't eat high-fat or sugary snacks. Go for healthier options instead – bread or toast, fresh fruit or raw chopped vegetables, breakfast cereal, plain popcorn and low-fat yogurts.**

# PHYSICAL EDUCATION LESSONS

To improve health it is recommended that: "children and young people should aim to participate in activity of at least moderate intensity for one hour every day"
Children who only take part in a little activity should gradually build up to this level.
The one hour of physical activity can be built up over the day, e.g. four 15 minute periods of activity.

## AIM

Over the three half terms introduce the idea of how children could be more active using ideas based on the British Heart Foundation Let's get physical pocket play pack.

### FIRST HALF TERM

In one lesson with the children discuss how they could increase their activity at home or on their own using idea sheet 1.

### SECOND HALF TERM

In one lesson with the children discuss how they could increase their activity in the playground or with friends using idea sheet 2.

### THIRD HALF TERM

During this term introduce the idea of increasing activity over a six week period using the Let's get physical pocket play pack.
Children who wish to can record their activities in the pocket play pack and if they have increased the time spent on activities during this period they can receive a certificate from the British Heart Foundation.

# Can you be active....

## .....on your own?

## Have you tried:

- Jogging
- Ice-skating
- Skateboarding
- Walking
- In-line roller-skating
- Cycling
- Skipping

**Keep safe when playing on your own and always remember to tell an adult where you are going and when you expect to get back.**

## If you enjoy skipping, try these challenges:

- Skipping as many times as you can in 30 seconds.
- Skipping backwards.

## If you enjoy roller-skating, skateboarding or riding your scooter, try:

- Travelling a set distance without falling over.
- Zig-zagging in and around some obstacles.

**Remember to wear protective gear on your head, elbows and knees when you're on your wheels.**


## ACKNOWLEDGEMENTS

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Design by Corinne Pearlman

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Comic Company
9 Calbourne Road
LONDON SW12 8LW
Tel 0208 675 1007
Fax 0208 675 7486
eat2bfit@comiccompany.co.uk
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